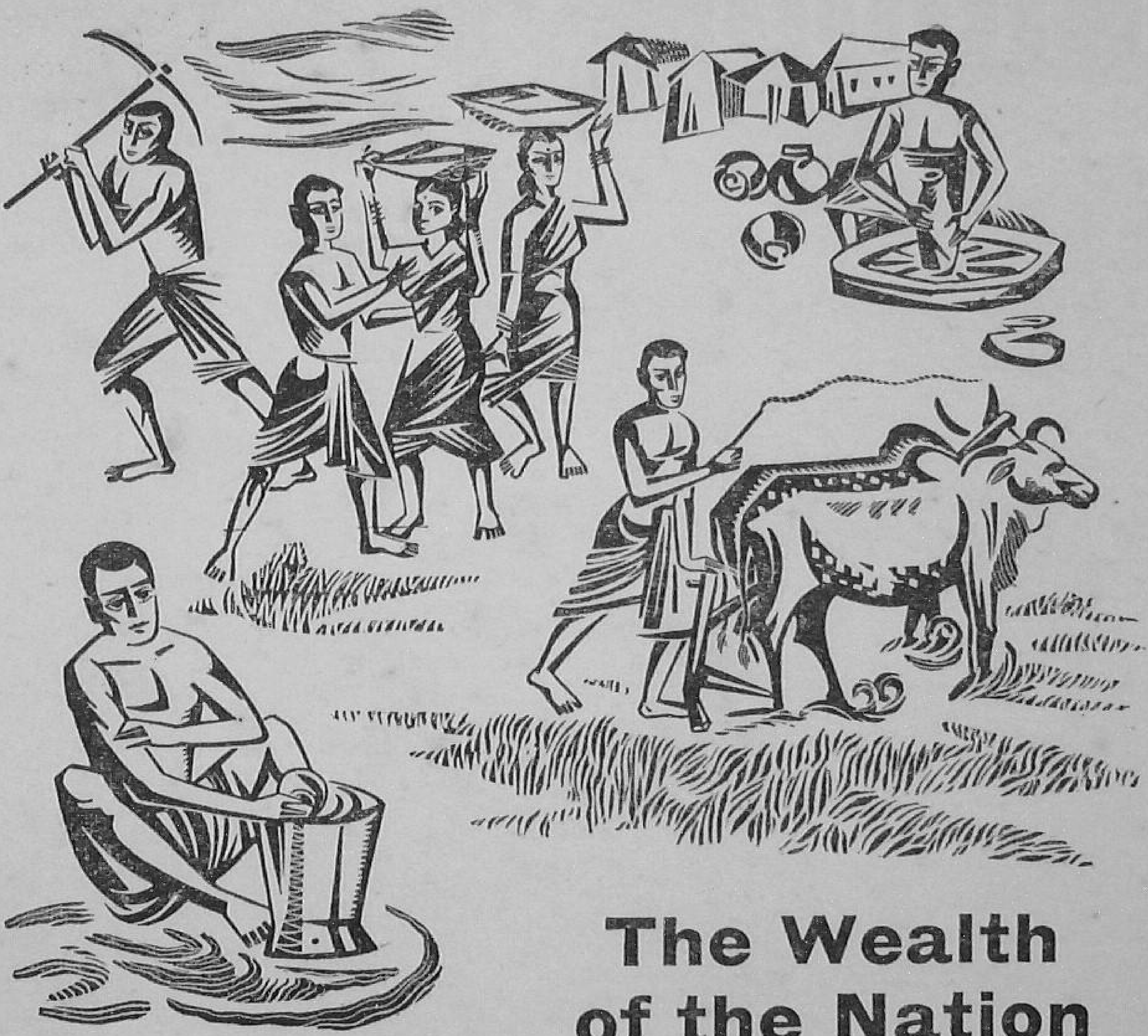
Indian Farming

JUNE 1959

OFFICE OF THE PRINCIPAL



The Wealth of the Nation

Tough, hard-working hands — hands that plough and sow and reap — farm-workers' hands: their skill and their toil produce the wealth of the nation. How vital therefore to protect their health.

And yet, because a farm-worker cannot avoid dirt while working, he daily runs the risk of disease and ill-health through infection from the germs that all dirt contains. For this reason alone it is important that self-help programmes in our villages should always point out the value of *self-help* in personal health and hygiene.

The villager who learns for himself and teaches his family the hygienic necessity of washing regularly with a good soap — and particularly with LIFEBUOY SOAP because it washes away the germs in dirt — is doing very much more than acquiring a healthy habit: he is helping to protect the nation's health and wealth.

LIFEBUOY SOAP

A PRODUCT OF HINDUSTAN LEVER

JUNE 1959

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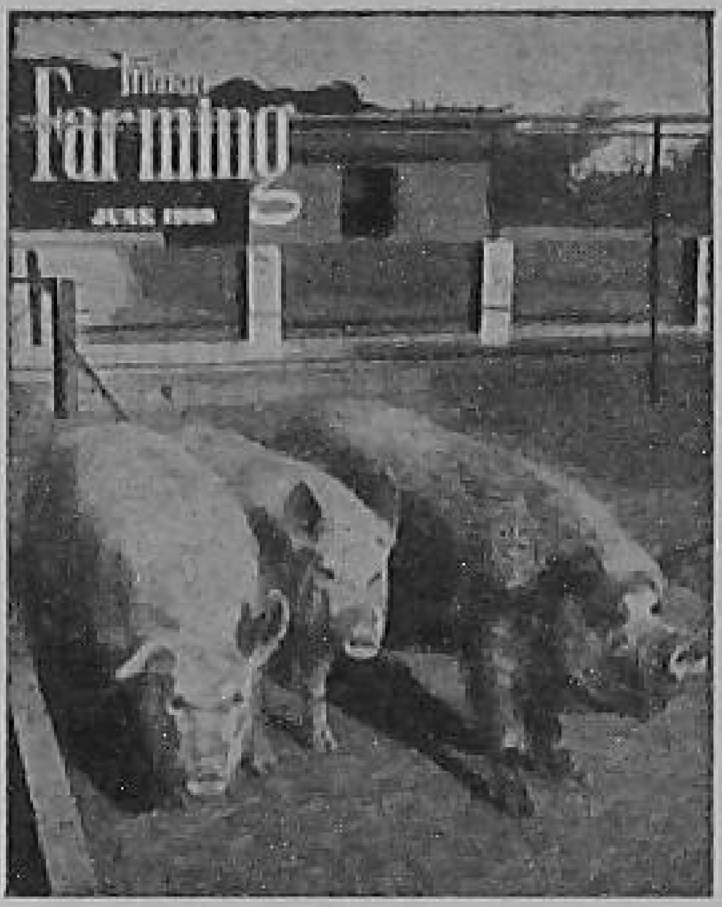
OUR COVER



Hog-raising goes very well with a mixed farming system, for hogs are never happy in cramped, dirty quarters, and if denied green feed and exercise. For more meat production in less time, however, add a tiny amount of Aureomycin to their feed

Photo by H. K. Gorkha

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Indian Farming

OFFICE OF THE PRINCIPAL
2 JUN 1959
EXTENSION TRAINING CENTRE

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Editor: **Harkirat Singh**

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NEW DELHI

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By Dr. M. S. Randhawa
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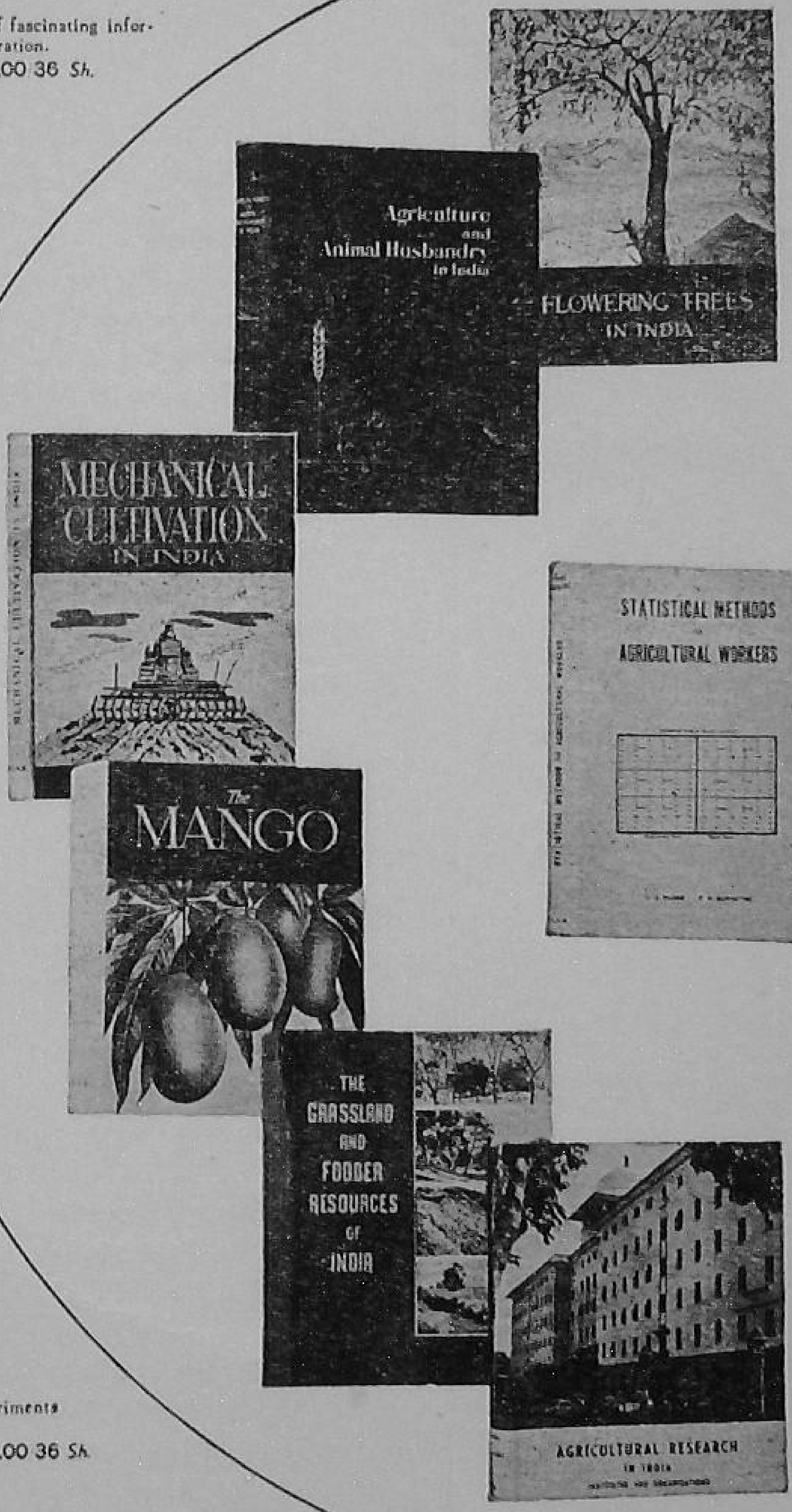

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WHY FEED PESTS?

DISEASES and pests rob the nation of some 20 per cent of the total rice produced in the country. This works out to about five million tons of rice, or about 1,000,000,000 rupees! If any of them appears in an epidemic form, 60 per cent of the crop may be lost, creating near-famine conditions.

And, a look at the number of diseases and pests involved would make one miss at least one heart-beat—nearly 40 diseases and 85 species of insects! The most destructive among the diseases are blast, Helminthosporiose, stem rot, foot rot and physiological rot; the chief field pests, the swarming caterpillar or armyworm, rice Hispa, grasshoppers, the *gundhi* bug and the gall fly. Even after harvesting, a number of moths and beetles, crabs, snails, rats and also birds eat away a good part of the produce.

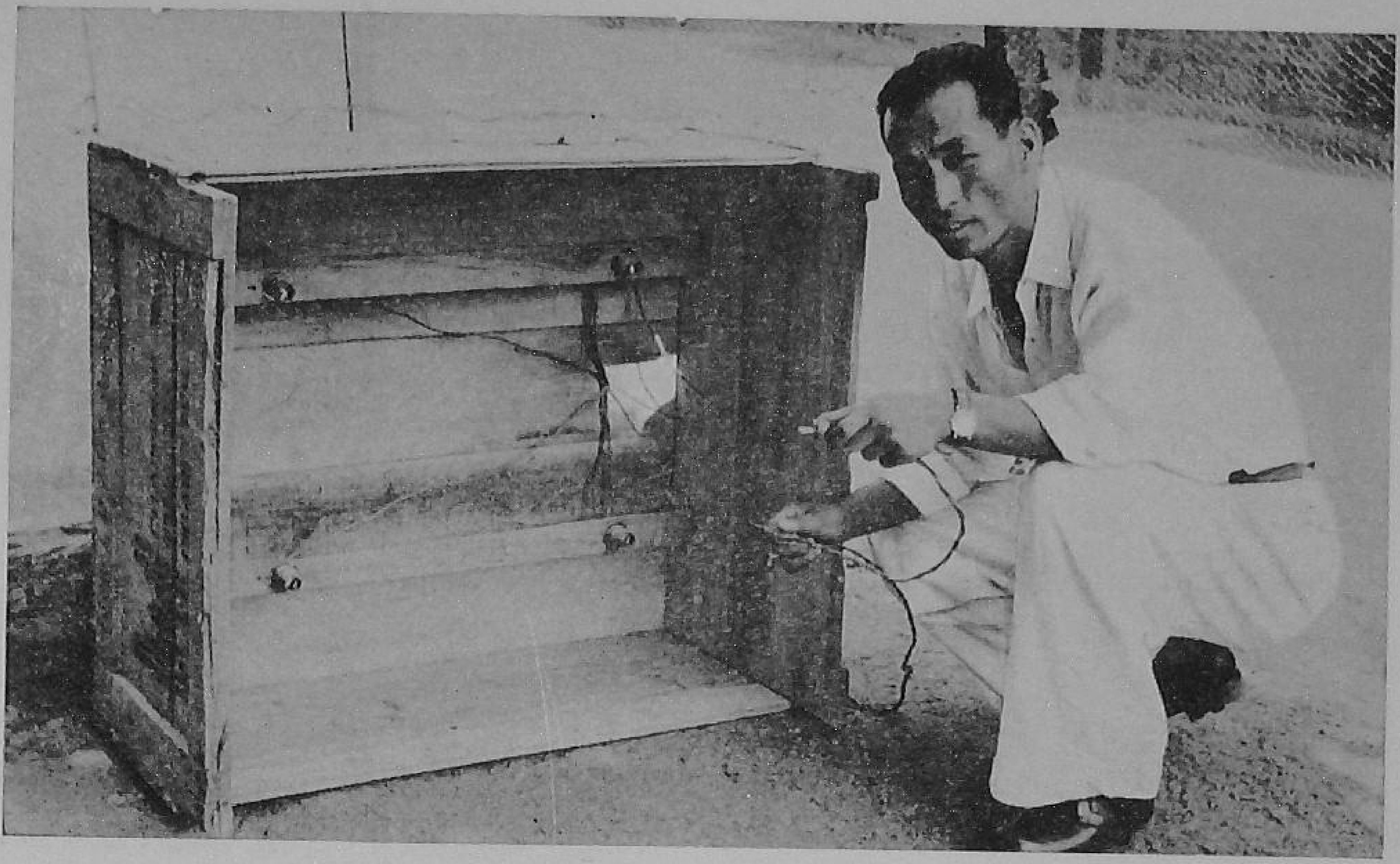
Since the crop is relatively more liable to a severe attack of pests and diseases at certain stages of its growth, and in a crop season there are certain peak periods of their incidence, the crop suffers the maximum damage if both coincide. However such an eventuality may not arise if the planting dates are suitably adjusted.

The normal loss from pests and diseases of rice can be avoided to a great extent by sowing only resistant varieties, pre-treating seed and observing simple cultural and preventive measures—destroying stubbles in the fields, keeping irrigation channels and field bunds clean of weeds, and preventing water-logging.

Heavy applications of nitrogenous fertilizers alone to the crop also invite pests and diseases; in this case, balanced fertilization is the answer.

The present food shortage in the country does not permit us to lose even one pound of rice. Let us resolve to be alert at all stages of the crop this *kharif*—before sowing, at sowing, in the nursery, after transplantation, in the young stage of the crop, at the milk stage, near maturity, at maturity and in storage; and, if a situation may so demand, to join hands and launch large-scale action.

After all, why feed pests at the cost of our countrymen?



Mr. Cheol and the foster-mother he has designed

Man of the Month

The Pukka Poultryman From Korea

by
Harkirat Singh

KOREAN initiative and Indian assistance have given birth to a model poultry farm in the temporary barracks at the New Delhi National Stadium. The farm is owned by a Korean prisoner of war, Major Ji Ki Cheol, who came to India in 1954.

Mr. Cheol, I was told by him, chose to "restart" life this way because he has already had some experience of poultry-keeping in Korea and China, and the Government of India was good enough to grant him a generous subsidy to carry out his plans.

He made a beginning in February 1959, with 1,100 day-old chicks bought from the Government Model Poultry Farm, Delhi State, and 700 from private sources. The main breeds were Rhode Island Red and White Leghorn, with a few birds of New Hampshire, Light Sussex and White Cornish, "to add variety to the flock," he said. When I enquired of him whether he did not find it exacting to look after such a big flock, he replied, "This is nothing. In Korea, we keep much bigger units, and I'm actually anxious to expand it further."

The present strength of his flock is about a 1,000 birds. He told me that he had sold off 800 cockerels so far, after keeping about a 100 to meet his own needs. He was now rearing 908 females into layers, of which about 200 would be laying eggs in another month or so.

An appliance on the farm that attracted my attention was the foster-mother used by Mr. Cheol to rear

his chicks for the first month. All the 16 of them he has made with his own hands, and the idea also is his own. "The usual design I have seen here concentrates the heat in the centre," he began, noticing my curiosity. "I have distributed the heat uniformly by putting a bulb at every corner."

Each foster-mother cost him about Rs. 16 to make. All that is required is an empty tea-chest, the necessary electrical fittings for four bulbs and a small piece of black cloth over the entrance. Economical, efficient and easy to make, I was convinced.

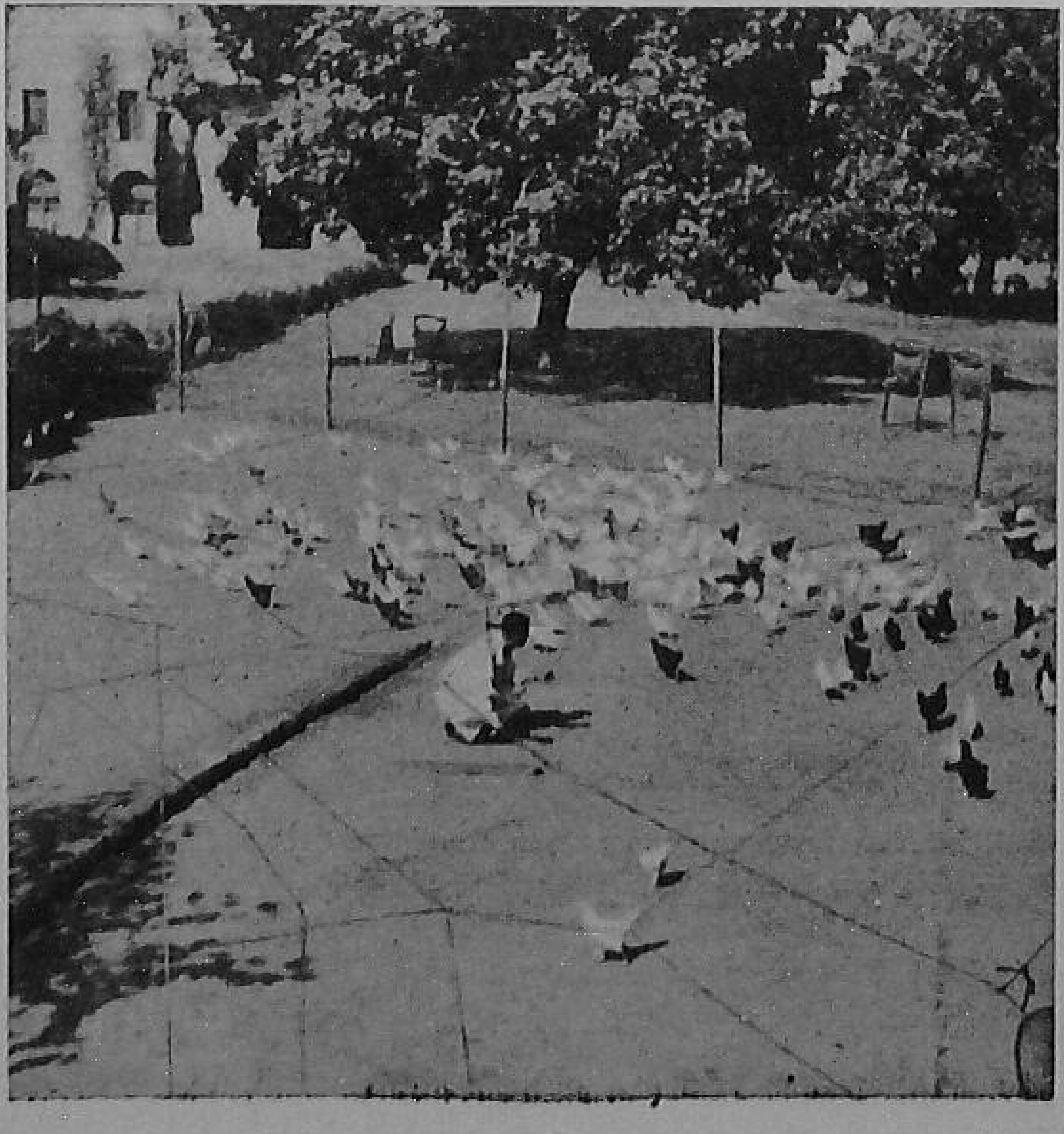
SECURE AND COMFORTABLE

Mr. Cheol pays special attention to the security and comfort of his birds. While a ferocious Alsatian takes care of cats, etc., an ingenious device prevents kites from swooping down on the birds. The device consists in "roofing" the yard with a criss-cross of ordinary ropes. "The cost of wire-mesh netting required to fix over the entire place would be prohibitive," he rightly pointed out.

Whenever they feel hot, Mr. Cheol's birds make a dash to the milk-bush

Then, I saw perfect arrangements to protect the birds from the scorching heat of the summer months: a temporary thatch shelter and a milk-bush hedge round the yard. The milk-bush forms quite a thicket and is not eaten by cattle. Cool, drinking water is always available to the birds through a water-channel dug right to the centre of the yard.

Well-secured against an attack by kites by an overhead criss-cross of ropes, the birds move about in the yard freely. Also seen is the water-channel going right up to the centre



"Of course, any poultry-keeper worth the name knows that perfect cleanliness, vaccination of chicks against Ranikhet and Fowl Pox, and proper feeding always pay," Mr. Cheol added.

ALL-MASH SYSTEM

Mr. Cheol follows the all-mash system of feeding. The birds have mash before them all the time. The mash contains: wheat bran 25 per cent, maize 30 per cent, groundnut cake 13 per cent, meatmeal five per cent, salt one per cent, bonemeal one per cent and *murgidana* 25 per cent. Chopped grass, "for green vegetables cost a lot these days," is fed to the birds at 9 a.m. and hoppers are then filled with mash. At 1 p.m., the mash is replenished. At 3 p.m., again grass. Again mash at 5 p.m.

When I admired some lovely, milk-white rabbits gamboling about amidst poultry birds, Mr. Cheol

told me something very interesting. "In China," he said, "they believe that rabbit urine prevents poultry birds from getting disease." And, he was quite emphatic about it.

FUTURE PLANS

The future plans of Mr. Cheol are as ambitious as his big start. He has already taken about 25 acres of land near Okhla on lease from His Excellency the Archbishop of Delhi. I accompanied him to the site, and, pointing to the sewage passing through his land, he told me that he proposed to take advantage of it and grow vegetables, fruits and flowers also.

He is also keeping two buffaloes and two pigs there, which were the nucleus of a full-fledged dairy and a 200 to 500-strong piggery, he said. He gives his pigs a mash containing 15 per cent corn, 30 per cent wheat bran, 15 per cent groundnut cake, ten per cent beans pre-soaked in water for three hours, 29 per cent paddy husk and one per cent salt, three times a day, and green vegetables twice a day.

Mr. Cheol is also anxious to purchase some turkeys. He plans to take up turkey breeding. The idea struck him when he found that foreigners in the Capital were hard put to it to get turkeys, even during Christmas. "I want to cash in on this scarcity. It's easy for me to do so, because turkeys can live on the same food as poultry birds," he informed me.

The only thing, he told me, was that they required very gentle care, at least during the first three months of their life, and that's why with ordinary people most of them died an early death.

ASSURED MARKET

For all his products—milk, eggs, chickens, ham, bacon, sausages, vegetables—Mr. Cheol would have an assured market in a nearby big Missionary hospital; "they will buy even rabbits for experimentation," he told me. "To tell you the truth, only this prospect prompted me to shift to this site," he added, smilingly, as I asked leave of him.

NEW BOOKS RECEIVED

Borculo and Harst—two illustrations of co-operative activity in the Netherlands

Published by the National Co-operative Rood, The Hague

Policies for Sound Economic Growth—tenth Annual Economic Review

Issued by the Information Division of Organisation for European Economic Co-operation, Chateau de la Mutte—2, rue Andre-Pascal, XVIe

Agricultural and Food Statistics

Issued by the Organization for European Economic Co-operation, Paris

Fertilizers—Production, Consumption, Prices and Trade in Europe—8th study, 1956-1959

Published by the Organization for European Economic Co-operation, Paris

Audio-visual Education (Report on the training course on visual aids held at Kota from 3rd to 8th February, 1958)

Published by the Central Committee for Co-operative Training, Agricultural Credit Department, Reserve Bank of India, Bombay

Statistical Yearbook, 1958

Published by the Statistical Office of the United Nations, Department of Economic Affairs, New York; price: clothbound $8.00, 57/- sterling, 34 Swiss francs; paperbound $6.50, 46/- sterling, 28.00 Swiss francs

Britain—An Official Handbook (1959 Edition)

Published by the Central Office of Information, London; Price 10*s.* 6*d.*

The Bombay Co-operator

Published fortnightly by the Bombay State Co-operative Union, Bombay; annual subscription Rs. 3

Statistical Statements relating to the Co-operative Movement in India, 1957-58

Published by the Reserve Bank of India, Bombay; price Rs. 5

Choose Your Plant Protection Implement

by

K. B. Lal

Plant Protection Adviser to the Government of India
New Delhi

AN important step in increasing production from crops is protecting them from pests and diseases. Suitable implements make this operation efficient as well as economical. A large variety of such implements is available in the market.

Plant protection implements, as they are called, range from very simple gadgets to large machines operated by engines of ½ to 12 H.P. or more. They include: hand, foot or power-operated sprayers, dusters, fog generators, mist blowers, seed-dressers, rat fumigation pumps, flame throwers and sprayers and soil injectors, and mechanical devices like bird scarers, light traps and hand-nets.

The smallest type of sprayer is a container holding about a pound of liquid spray, which is forced out as tiny droplets by a simple pumping action. A popular type is the knapsack sprayer—carried on the back of the operator with the necessary pressure pumped in—in which the release of the spray liquid is controlled. Where pedal action is employed, a separate reservoir

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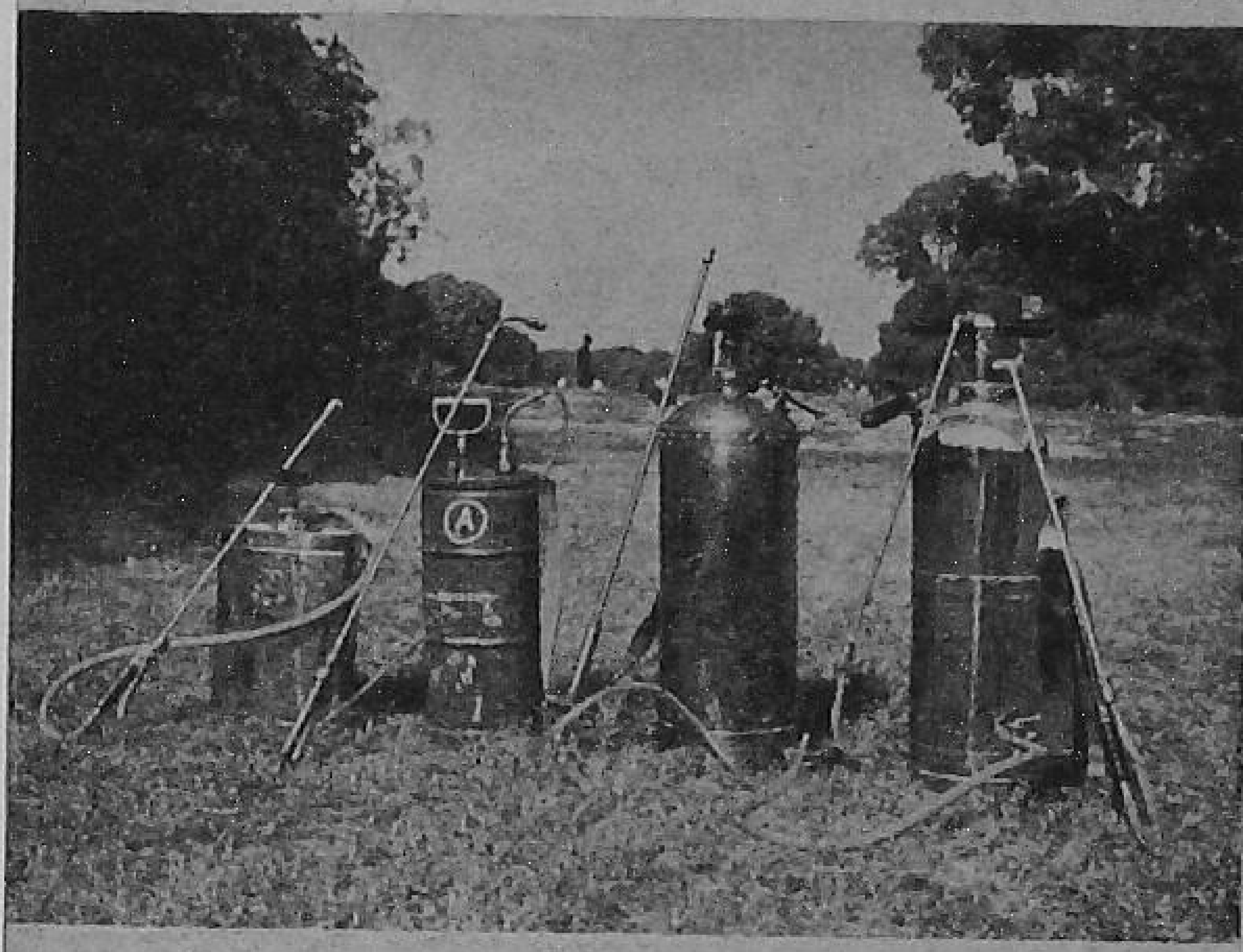

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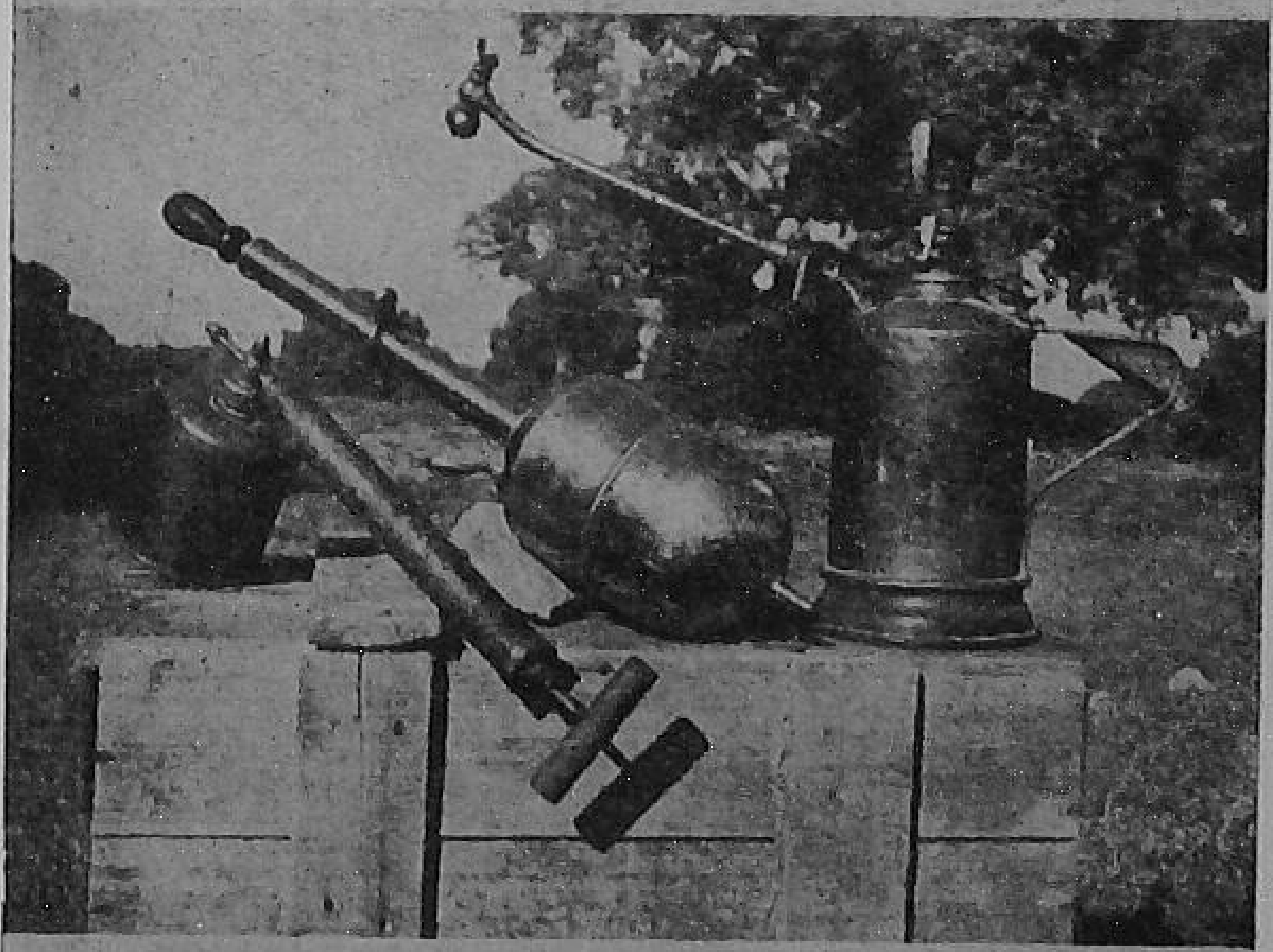

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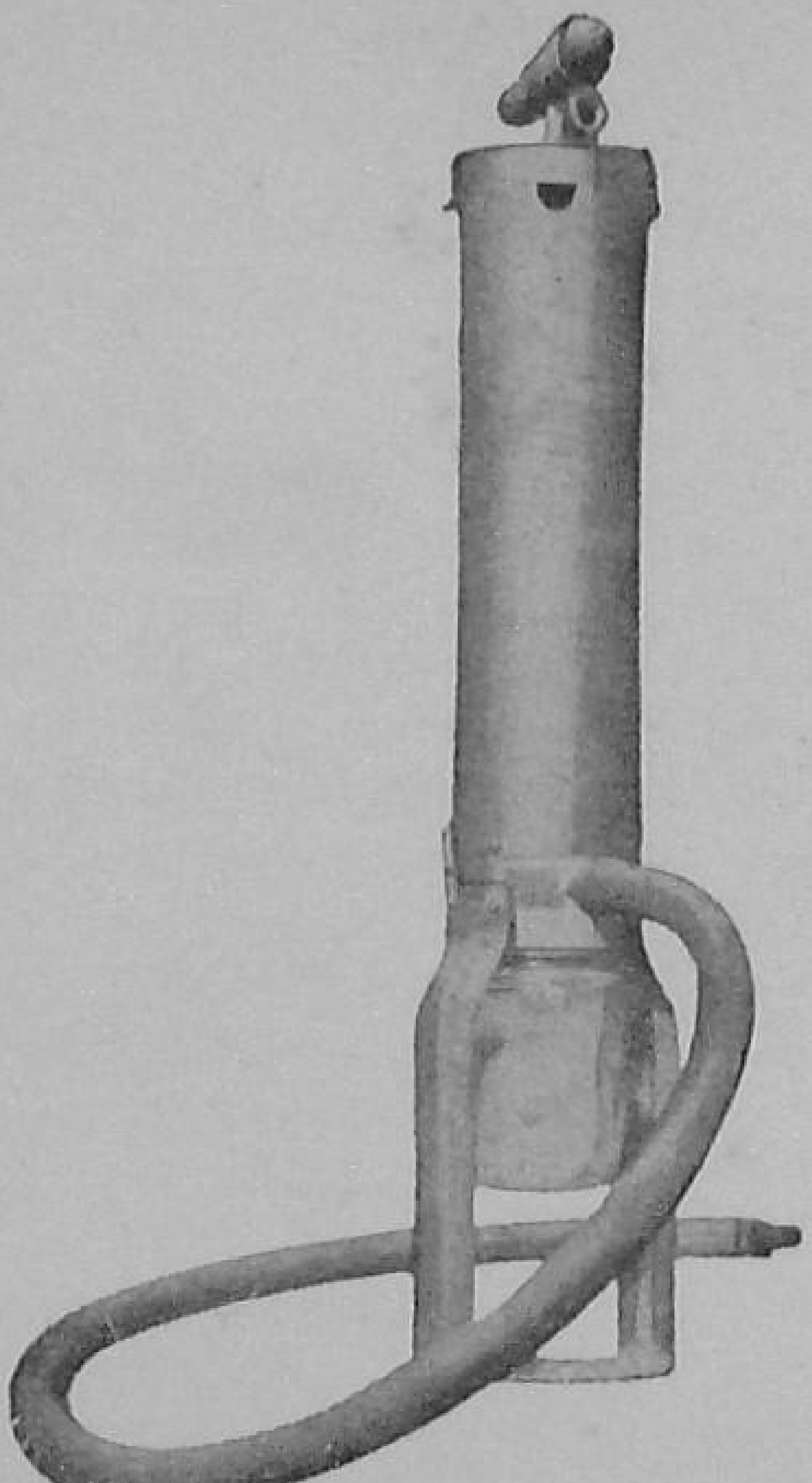
1. Hand-operated dusters
2. and 3. Hand-operated sprayers —big and small
4. A power-operated sprayer

is provided for the spray liquid. Power-operated sprayers release the spray liquid under control from containers which may or may not be an integral part of the machine. Hand and power-operated dusting machines work on the same principle, but blow dust instead of liquid droplets. Fog generators and mist blowers are extreme variations of power spraying



A rat fumigation pump

machines ; they transform the spray liquid into droplets having the effect and the appearance of fog or mist. They are particularly helpful for dense crops and plantations where deep penetration of the poisonous fog is required.

SATISFACTORY PERFORMANCE

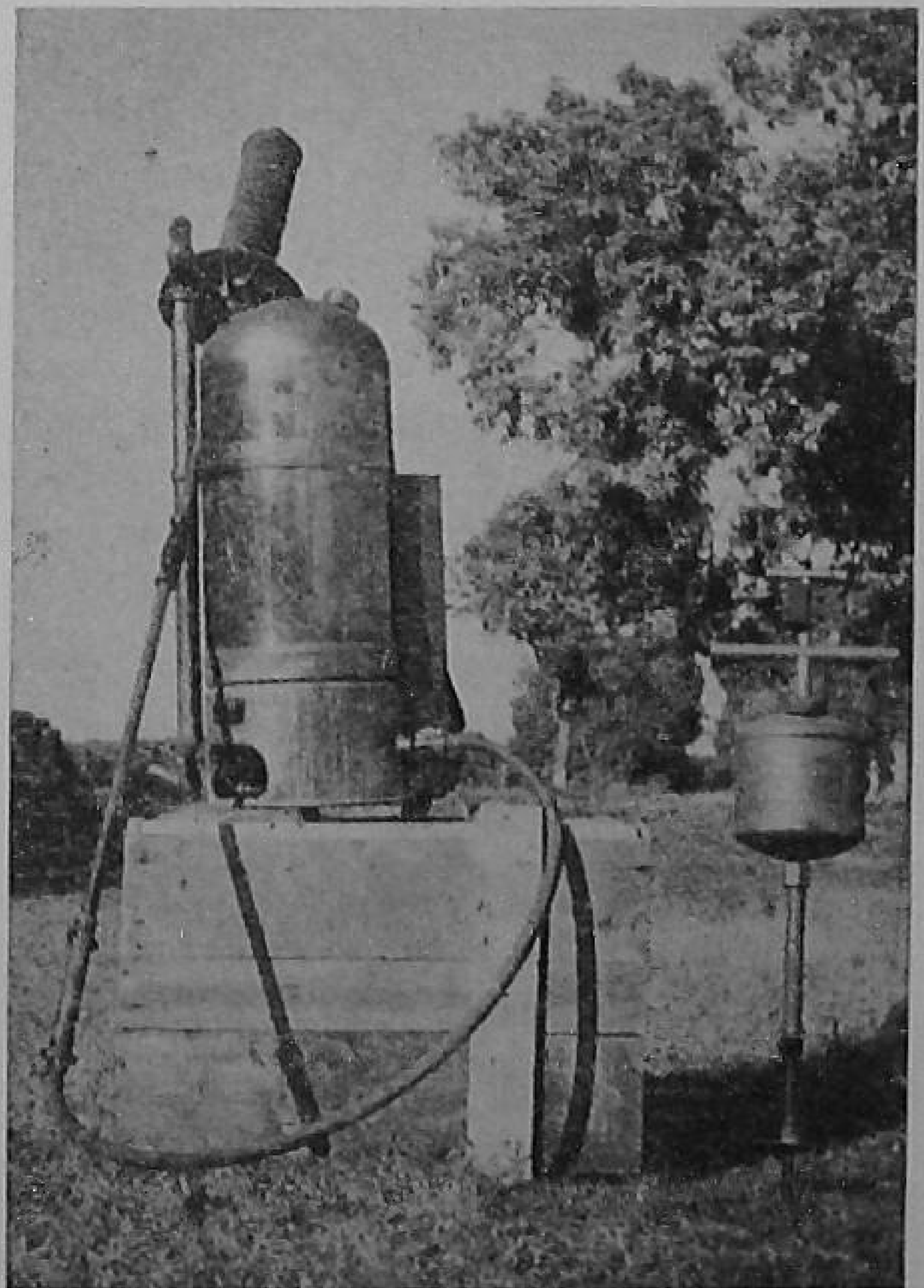
The satisfactory performance of a hand-operated sprayer largely depends on the pressure developed in its container or chamber by easy and simple strokes, as well as on a uniform flow of minute droplets from its nozzle. A good hand-operated duster should give an easy and uniform flow of dust by simple strokes or rotations without tiring the operator unduly. Neither should leak. The efficient performance of power-operated sprayers and dusters depends basically on the design and the horse-power of their engines. The higher the horse-power, the greater the force with and the distance to which spray liquids or dusts are thrown or conveyed. There are some other factors also. For example, if the engine does not have a satisfactory cooling system and gets heated up early, it has to be stopped every ten minutes or so—which hampers the progress of the work. Or, if satisfactory controls are not provided, it is not easy to regulate the flow of the spray or the dust.

Flame throwers and flame sprayers are essentially like knapsack sprayers. Flame throwers, which use a mixture of petrol and kerosene oil, give out a long flame, about 12 feet in length, at the outlet nozzle. This flame is used to burn up locusts congregated in bushes and trees, and unwanted dry vegetation. Flame sprayers are a modified version of flame throwers, and produce small, fan-shaped jets of flame.

Seed-dressers are employed to coat individual seeds of cereals, castor, cotton, etc., with a thin, uniform film of some poisonous dust to destroy disease organisms. Most mechanical seed-dressers consist of either a rotating drum or a vertical cylinder through which the seed and the chemical pass and get well mixed up in the process. Electrically operated seed-dressers can treat large quantities of seed in less time.

Rat fumigation pumps are used to pump calcium cyanide powder, which on contact with moisture

A flame thrower (*left*) **and a soil injector** (*right*)



generates hydrocyanic acid gas, into rat and other burrows.

Soil injectors are used for applying liquid fumigants to the soil at a depth of six to seven inches to control soil pests, particularly eelworms. For treating large areas, power-driven, trailer-type soil fumigators are also used.

Using a seed-dresser

The bird scarer is comparatively a new machine in India. It gives out loud reports at intervals of a minute, which scare birds away from crops or fruit trees.

Hand-nets are used to collect insect pests in large numbers for destroying. Light traps, with kerosene or petromax lamps in a basin containing kerosenized water, are set up in the field at night to attract insect pests.

COST

The following will give an idea of the cost of various plant protection implements.

Implement	*Price in rupees*
Small, hand-operated sprayers	25 to 125
Knapsack sprayers, foot sprayers	75 to 283
Power sprayers	800 to 9,500
Hand-operated dusters	5 to 130
Power-operated dusters	625 to 2,520
Fog generators	1,175
Mist blowers	1,135 to 4,500
Hand-operated seed-dressers	20 to 156
Flame throwers	127 to 290
Flame sprayers	90 to 100
Rat fumigation pumps	35 to 42
Soil injectors, hand-operated	95
Bird scarers	120
Hand-nets	3 to 7

In all plant protection machines, lightness of weight, convenience of handling, transport and operation, easy mobility on the ground (if power-operated), proper functioning of the control gadgets, uniformity of discharge of liquid or dust through nozzle or outlet and the coverage, are basic requirements. In India, where regular paths or tracks in fields are not always found, the lightness and mobility of a machine assume great importance. Much also depends on the nature and type of accessories such as hose-pipes, lances and nozzles.

WORKING LIFE

As with all machines, the greater the care with which plant protection machines are selected and maintained, the longer their life. Rubber hose-pipes, especially those that convey liquid chemicals, suffer damage quickly if they are not properly drained off and cleaned after use. In general, a hand or foot-operated spraying or dusting machine may have a working life of about 2,000 hours and a power-operated one of about 3,000 hours.

It has been estimated that one man working eight hours a day, with reasonable periods of rest, should be able to dust two to three acres or spray 1.5 to two acres of a low crop with a satisfactory hand-operated machine. A power sprayer of about two horse-power and with satisfactory accessories should be able to spray about ten acres of crop in eight working hours. In using power sprayers or dusters, about 50 to 66 per cent of the time is taken in feeding the tanks and manoeuvring the machines in different positions, and only about 34 to 50 per cent in the actual operation. Given satisfactory machines, therefore, the subsequent progress of the work would depend on the supporting arrangements for the supply of water or dust, the ease with which the machines can be manoeuvred and the judgment and the speed of the operator.

TWO BETTER WHEATS

COME TO BIHAR

by
S. Nezamuddin
Agronomist, Bihar
and
J.S. Flora
Agricultural Research Institute
Sabour

At least 45 rupees more from every acre grown with wheat: that is what Bihar farmers would get if they took to the varieties *NP 798* and *NP 799*. No less than 180 trials at Government farms as well as on farmers' fields go to prove this. What's more, the two varieties are able to withstand rust very well: this was seen during the 1956-57 epidemic that took a heavy toll of the local wheats in the State.

The trials were conducted for three years, from 1955-56 to 1957-58. The other varieties tested were *NP 710*, *NP 755*, *NP 758*, *NP 761*, *BR 319* and the standard *NP 52*. Of the 180 trials, 76 each were conducted in north and south Bihar and 28 in Chhotanagpur and Santhal Parganas.

Although a major *kharif* crop like paddy or maize preceded almost every experiment, *NP 798* and *NP 799* yielded 18 to 20 maunds per acre in north Bihar, 21 to 22 maunds in south Bihar, and 15 to 16 maunds in Chhotanagpur and Santhal Parganas. The increase in yield over *NP 52*, the standard variety, respectively, was about 20 and 16 per cent in north Bihar, about 6½ and 9½ per cent in south Bihar, and about six and one per cent in Chhotanagpur.

In the light soils of north Bihar and the heavy soils of south Bihar, *NP 798* and *NP 799* were undoubtedly superior to all others. But in the third agro-climatic zone, i.e., the hilly tracts of Chhotanagpur and Santhal Parganas, *NP 758* also proved promising, closely followed by the early varieties *NP 761* and *BR 319*.

NP 798 and *NP 799* mature in about 115 and 112 days, respectively, which compares favourably with early varieties like *NP 761* and *BR 319* maturing in about 109 and 111 days. They can be sown as late as the second week of December, after taking a full-fledged paddy crop during *kharif*.

NP 798 and *NP 799* can be easily distinguished from the other varieties by their long, thick and tipped ear-heads. Their grains are also bolder, the 1,000-grain weight being about 39 and 41 grams, respectively, compared to the 31 of *NP 52*.

Wheat is the most important cereal crop of Bihar after paddy, and is now grown over 19 lakh acres. So that they may reap rich harvests, wheat farmers in the State would do well to switch over to *NP 798* and *NP 799*.

***NP 798* and *NP 799* stand for more wheat production in Bihar**

Vedapatti Farm Shows the Way to Commercial Agriculture

by
Sundaram Meenakshi

AMONG the fragmented holdings of the dry and garden lands of Vedapatti village—about six miles from Coimbatore, lies the P.S.G. Farm pointing the way to successful commercial farming. At this Farm, only improved agricultural practices are adopted: the Japanese method of paddy cultivation, composting of farm wastes, use of improved strains and systematic farm operations. A salient feature is that all kinds of improved implements, iron ploughs and machinery for preparatory cultivation, sowing, intercultivation and harvesting and other farm operations, are used. In fact, the Farm used to serve as an Experimental and Demonstration Farm for testing the ploughs, harrows, puddlers, green-manure tramplers, bund-formers, scrapers, weeders, seed-drills and other farm implements which were manufactured at the P.S.G. Engineering Institute.

One of the cash crops grown at the Farm is chicory

IRRIGATION FACILITIES

The Farm comprises 290 acres, of which lands irrigated by river-fed flow irrigation cover 50 acres. About 220 acres of garden lands are irrigated by lift irrigation through wells. The remaining 20 acres are the *tope* or orchard.

The garden lands get their water supply from six wells with an average depth of 70 feet. Each well is fitted with a ten to 20 H.P. motor with centrifugal pumps. The *tope* is irrigated by channel water and also by water from two wells with an average depth of 35 feet.

There are sixteen cisterns to hold water, which are connected by concrete pipes of one foot diameter. Water is pumped into the cisterns from the wells and distributed by the simplex system. A unique feature of the irrigation system is the turbine pump worked by a 20 H.P. motor.

CROP ROTATIONS

The crops usually grown are:

(*i*) Cereals: *ragi, jowar, bajra*
(*ii*) Cash crops: cotton, sugarcane and chicory
(*iii*) Plantation crops: banana and arecanut

No rigid crop rotation is followed, but the normal pattern is:

Paddy—one year
Sugarcane—two years
Cotton, first crop, followed by *jowar*
Cotton, second crop, followed by *bajra* and *ragi*
Cotton followed by *bajra, jowar* or *ragi*
Chicory followed by cotton
Jowar on 20 dry acres when irrigation facilities are meagre in a particular year
Bananas every six months

The following cropping scheme has resulted in high yields and thereby good profits:

Paddy, first crop	July-December
Paddy, second crop	January-April
Ragi	April-August
Jowar, first crop	February-May
Jowar, second crop	July-December

Bajra	March-May
Cotton, first crop	August-March
Cotton, second crop	February
Sugarcane	February-November of the next year
Chillies	September-April
Chicory	
Bananas	January-June/August

METHODS ADOPTED

The improved varieties of paddy evolved by the State Agriculture Department, like *Co. 19*, *GEB. 24* and culture *6538* are grown on 40 acres. The Japanese method of paddy cultivation as adapted to Madras conditions is practised. Before puddling the fields with the wet-land puddler, a dose of 20 cartloads of green manure is applied with the trampler. Subsequently, superphosphate at 224 pounds per acre is applied to the crop. The crop is irrigated every alternate day. The normal yield is over 4,200 pounds per acre.

The second crop of paddy is grown during summer. Raised seed-beds and transplanting in lines are the special features. Cultures *6522* and *6517* are the varieties that are grown. Before puddling the fields, superphosphate is applied at 224 pounds per acre. The crop records an average per-acre yield of 3,350 pounds. In certain years, the yield may amount to 4,500 to 5,000 pounds.

A well-grown crop of *MCU 2* cotton

Ragi is grown on 30 acres. The *Co.2* variety is used. The manuring formula adopted is : 320 pounds of groundnut cake powder, 112 pounds of superphosphate and 112 pounds of ammonium sulphate per acre. The crop receives 12 irrigations. An average yield of 2,800 pounds of grain is harvested in a normal season.

Two crops of *jowar* (*cholam*) are taken. The first crop is grown on 70 acres. *Co. 12* and *Co.18* are the varieties. Groundnut cake powder at 320 pounds per acre and ammonium sulphate at 112 pounds are usually applied. Five irrigations are given. An average yield of 2,900 pounds of grain is obtained.

The second crop covers 37 acres. This time *Co.1 cholam* is grown. The crop receives only one irrigation. The average yield is 1,600 pounds of grain per acre.

Bajra (*cumbu*) is grown on 25 acres. The variety is *Co.4*. The manures applied are: 160 pounds of groundnut cake powder and 56 pounds each of superphosphate and ammonium sulphate.

Covering 30 acres on the Farm, bananas bring in good returns

Chillies are grown on six acres. The local round variety is cultivated. Two hundred pounds of groundnut cake powder are applied to the crop. The crop receives 12 irrigations. An acre-yield of 800 pounds of dried chillies is obtained in normal years.

The first crop of cotton occupies a 100 acres. The improved varieties *MCU 1* and *MCU 2* are grown. The seed is usually dibbled in furrows. The manures applied are: 320 pounds of groundnut cake powder, 112 pounds of ammonium sulphate and 112 pounds of superphosphate per acre. The crop is irrigated 12

times a year. An average yield of 1,680 pounds of *kapas* is picked every season from an acre.

The second cotton crop is grown on five acres in rice fallows during summer. The *P 216 F* variety is used.

TWO-YEAR CROP

A two-year crop of the *Co. 419* variety of sugarcane is grown on 36 acres. The setts are planted in furrows at 20,000 to the acre. The cropping period runs from February to November of the succeeding year. The manuring schedule adopted is: penning of 2,000 sheep per acre and 224 pounds of bonemeal; after three months, 224 pounds per acre of ammonium sulphate are given; the ratoon crop is manured with 448 pounds of ammonium sulphate in two doses. The crop is irrigated 30 times. Harvesting begins by March.

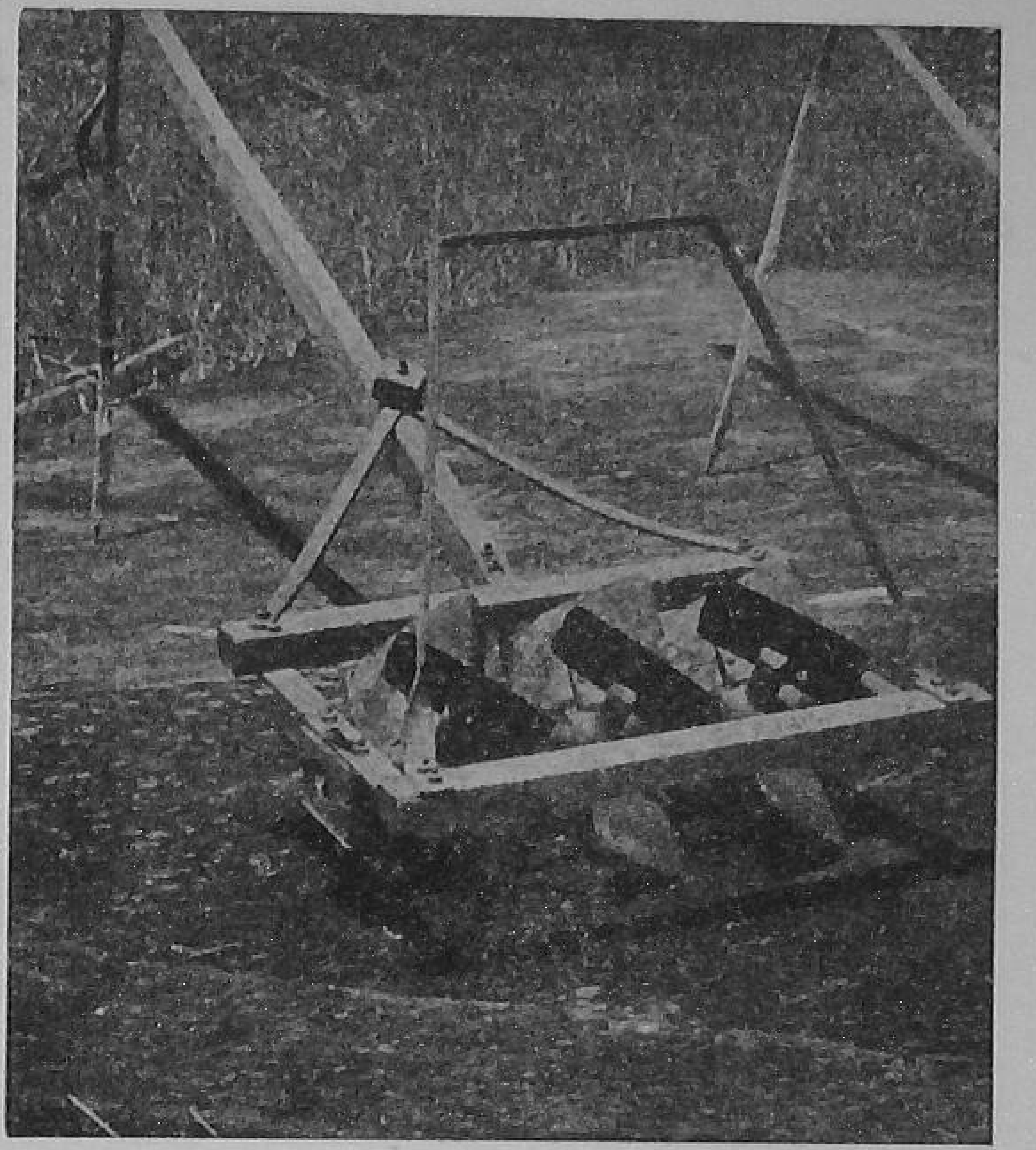
The canes are crushed at the premises of the Farm with PSG cane crushers. Jaggery is prepared by improved methods. "Hydrosol" is used as a clarificant to give it an attractive colour. As many as 1,26,000 pounds of jaggery, at 280 pounds per ton of cane, are obtained.

Chicory is grown on 16 acres as an irrigated crop. The crop is given 25 irrigations in a season. The yield ranges from 3,000 to 4,500 pounds of dried chicory roots per acre.

Plantain varieties of bananas occupy about 30 acres. About 800 suckers to an acre are planted 6½ feet apart. The varieties grown are *Nadan*, *Monthan* and *Poovan*. Each plant is manured at five pounds of green leaves and ten pounds of compost, or a mixture of 224 pounds of ammonium sulphate and one ton of groundnut cake powder. The crop is given 30 irrigations. The bananas give an average annual return of Rs. 1,600 to 2,000 per acre.

A few arecanut palms are also grown as an experiment.

The Vedapatti Farm is indeed a bold venture in commercial farming. For an annual outlay of about three lakhs of rupees, a net profit of about Rs. 75,000 is earned in normal years.



The new puddler

Puddling Machine for Rice Fields

A MACHINE for puddling rice fields with standing water has been tried at the Central Rice Research Institute, Cuttack, and found very cheap and useful. It has several rotating blades or shares. It cuts the soil and churns it, and can be easily drawn by a pair of bullocks. After filling the field with water, the machine has to be worked only once or twice.

Puddling is an important operation before transplanting paddy seedlings in the field. Ordinarily, the *desi* plough is used, which only cuts the soil. To get a good puddle, therefore, several ploughings have to be given.

The machine is useful for all soils except clayey ones. About three acres can be puddled in eight hours. Even the green manure crop can be well turned over. It costs Rs. 70, if manufactured locally.

—M.V. Vacchani
Central Rice Research Institute, Cuttack

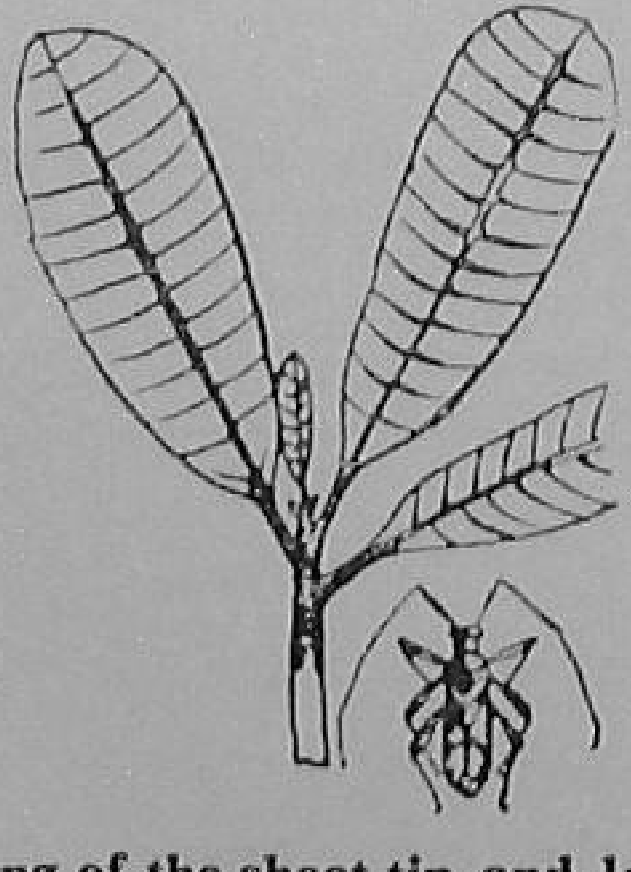
Wilting, and...

Killer Insects Of Cashew

by
E.V. Abraham

CASHEW growers, particularly on the West Coast, feel greatly baffled when they see fresh shoots drying up. Another equally serious problem for them is the fading of the inflorescence and shedding of flowers. Observations made under a scheme financed by the Indian Council of Agricultural Research now reveal that apart from soil and climatic conditions and fungus diseases, some insect pests too have a big hand in bringing about these conditions.

The most serious among them is the tea mosquito *Helopeltis antonii* S. This reddish-brown bug is easily distinguished by its peculiar projecting, knobbed, pin-like process on the dorsal side of its thorax. The larvae look like ants and move very slowly.



...blackening of the shoot tip and leaf midrib caused by the tea mosquito

The adults and nymphs puncture the tender shoot tips, young leaves, inflorescence stalk, tender "apples" and nuts. The punctured spots first appear as circular, depressed, water-soaked spots. Later, numerous such spots coalesce and turn dark.

Usually, the punctured shoots dry up to some length, but in severe cases, the entire shoot and the inflorescence fade and dry up. Sometimes young plants are killed outright. The insect appears in a pest form at the time of the new flush, i.e., in August and November-December. Twenty-five per cent of the shoots may be found damaged.

Spraying DDT 0.1 per cent (one pound of 50 per cent DDT W.P. in 50 gallons of water) is effective against the pest.

CHELARIA CATERPILLAR

Another important pest is the caterpillar of *Chelaria haligramma* M., a small, dark brown moth. The caterpillar when full-grown is about half an inch long. It bores into the tender shoot tips and the developing inflorescence. It also bores into the flower buds and eats up the contents. It pupates inside the bore-holes or leaf-folds; the adult moth emerges in about a week.

Gum exudation sets in on the floral branches, they assume a sickly appearance, and eventually dry up. Damage to fresh shoots is up to about 26 per cent. In

a garden in Tiruchirapalli district of Madras State, 60 per cent of the inflorescence was found affected.

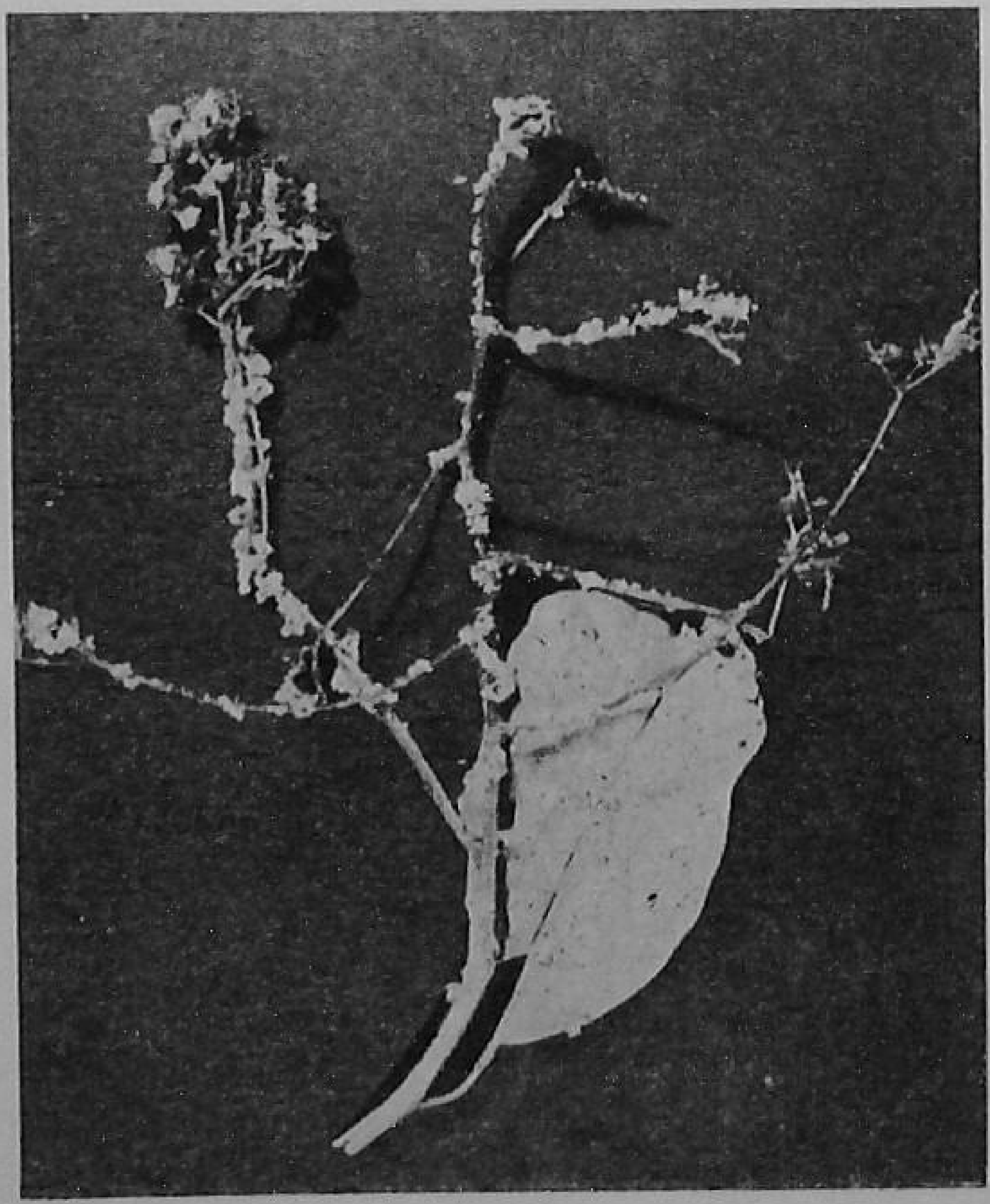
If the *Chelaria* caterpillar chooses to feed on cashew inflorescence, shoot tips get stunted

Spraying of DDT 0.2 per cent (one pound of 50 per cent DDT W.P. in 25 gallons of water) is suggested.

MEALY BUG

Infestation by the mealy bug *Ferrisiana virgata* C. and the aphid *Toxoptera odinae* Vdg. generally occurs in a mild form on tender shoots and the inflorescence. But cases of severe attack are also met with occasionally. A heavy infestation particularly affects the inflorescence.

Mealy bugs too make a good meal of the inflorescence

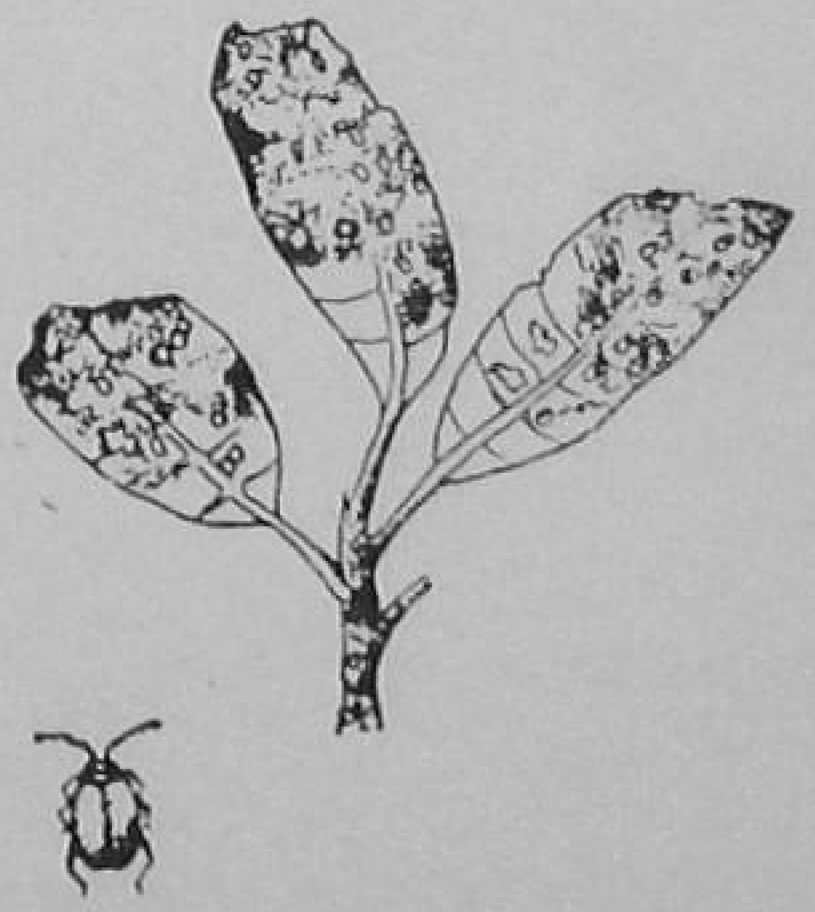


Spraying of "Parathion" 0.025 per cent (one ounce of "Folidol E. 605" in 12½ gallons of water) exterminates both the pests. Spraying of BHC at 0.1 per cent (one pound of 50 per cent BHC W.P. in 6½ gallons of water) against the mealy bugs and 0.05 per cent (one pound in 13 gallons) against the aphids, is also effective.

OTHER INSECTS

The wax scale *Ceroplastes floridensis* C. causes the drying up of tender shoots. Mechanical removal of freshly infested shoots and spraying with "Parathion" 0.025 per cent will control the pest.

A small, red Chrysomelid beetle *Monolepta longitarsis* Jac. has been found to appear in large numbers during



Characteristic of damage by the Chrysomelid beetle are scraped tissues

the monsoon season (June to August). It scrapes and eats the green tissues of the tender shoot tips and leaves. The affected shoot tips dry up. Occasionally, caterpillars of the Lymantrid moth *Euproctis scintillans* W. also feed on the inflorescence, branches and tender leaves by scraping the green tissues during their early gregarious stage. This causes the drying up of stray inflorescences.

Spraying BHC 0.05 per cent (one pound of 50 per cent BHC W.P. in 13 gallons of water) is effective.

A word of caution: due precautions should be taken when handling the insecticides, particularly "Parathion," which is highly poisonous.

WITH a view to increasing production from the existing area under berseem, a number of experiments have been under way at the Fodder Research Station, Sirsa. Results show that both nitrogen and phosphate increase berseem yields appreciably.

Due to its high yield, palatability and nutritive value, berseem has become very popular as a *rabi* fodder in irrigated areas in the plains and in the hills. It has been found to be the cheapest means of increasing milk yield and improving soil fertility, and has rapidly displaced other *rabi* legumes like *metha* and *senji.* Income from this crop is double that from wheat and on a par with that from any vegetable.

At the Station, efforts were first made to breed new high-yielding berseem varieties. About half a dozen new varieties were tried on a field scale for three years, but they failed to maintain their superiority. The only alternative left was to try fertilizers. Nitrogen and phosphate, singly and in various combinations, were used.

GOOD START

Nitrogen gives the crop a good start and accelerates its growth in the early stages. Treating the seed with berseem inoculum enables quick formation of nodules on the roots, and thus improves the uptake of atmospheric nitrogen. The increase in yield, however, is not proportional to the increase in the dose of nitrogen.

Fifty pounds of nitrogen, or 2½ maunds of ammonium sulphate, costing about Rs. 35, were found to increase the yield by about 40 maunds in the first two cuttings ; taking the price of fodder as one rupee per maund, this gave a net gain of five rupees only, but increased the availability of fodder in the months of November and December.

Fifty pounds N along with 50 pounds P_2O_5 per acre was the most economical dose. It cost Rs. 60. The increase in yield was about 116 maunds, giving a net gain of Rs. 46.

At Palamput, under hilly conditions, 40 pounds N per acre was found to be the most economical dose.

The effects on forage yield of various methods of application of phosphates like superphosphate and dicalcium phosphate, singly and in combination with nitrogen and sulphate ions, were studied. It was found that a combination of nitrogen and phosphate applied broadcast over the surface at sowing was superior to drilling.

Berseem is best grown on well-prepared, level land. If the farmer is interested in intensifying his cropping in rotation with crops like sorghum, cotton or rice, he will find it worth-while to use 40 to 50 pounds N+50 to 100 pounds P_2O_5 before sowing.

A well-fertilized crop of berseem

Berseem Yields High, If Fertilized

by
H.C. Malik
A. Economic Botanist
Sirsa, Punjab
and
P.C. Batra

WHAT'S NEW IN FARMING

INCREASING GROUNDNUT YIELD

By taking the following five easy steps, Punjab farmers can considerably increase their groundnut yield, experiments conducted at the Groundnut Experimental Station, Samrala, show.

Firstly, use only improved seed. *Punjab Groundnut No.1*, the improved variety suitable for Ludhiana and Ambala districts, yields two to three maunds more per acre than the local variety. This variety has a higher oil content and also a higher shelling percentage than the local one.

Secondly, treat the seed with "Ceresan" before sowing. Use one part of the chemical for 400 parts of the seed. This prevents the germinating seeds and the seedlings from dying.

Thirdly, sow the seed with a spacing of 12 inches between rows and nine inches between seeds in the row. This yields at least four maunds more per acre than the local practice of sowing groundnut in rows 24 inches apart.

Fourthly, apply one and a half maunds of ammonium sulphate per acre. This increases the yield by about six maunds per acre.

Finally, spray Bordeaux mixture (2 : 2 : 40) twice on the crop, if the *tikka* disease attacks it. The first spray should be given seven weeks after sowing and the second, two weeks later.

JASSID AND WHITEFLY

In many areas of the Punjab, farmers growing American cottons find their yields going down because of the cotton jassid and the cotton whitefly. The loss is estimated at five crores of rupees a year.

The cotton jassid sucks the sap out of the leaves. As a result, leaves turn brown, crumple, wilt and dry up. The growth of the plant is affected badly and the yield goes down. The cotton whitefly also sucks the sap of the plant, and is most active from April to September.

Recent research has shown that both the pests can be easily controlled by spraying the crop with a mixture of 0.1 per cent DDT and 0·1 per cent BHC suspension or 0.02 per cent "Endrin" emulsion. Fifty to 100 gallons of the spray material is needed per acre. The spraying is done at intervals of two weeks.

The increased yield obtained by taking up this treatment more than compensates for the cost incurred on the insecticide and spraying.

LUCERNE ON HILLS

Latest experiments show that lucerne is a suitable forage crop for the north Indian hills.

In the experiments, lucerne was grown both in cultivated plots and on uncultivated slopes between terraced fields. The crop resisted the cold as well as the drought of the winter months. In cultivated plots, it gave 500 maunds of forage per acre, while on the slopes, along with grasses, it yielded 600 to 700 maunds of forage per acre.

It was also seen that both as green forage and hay, lucerne makes a very nutritive fodder for cattle.

NEW WILT-RESISTANT TOMATO

The wilt disease of tomato is a common disease which occurs in all stages of the crop. Plants affected by the disease show curled and wilted leaves and appear pale-brown. The leaves and stems gradually wilt and dry up. The damage is severe during the rainy season. The crop-yields decline rapidly, once the plants are affected. There are no effective methods of control. Cultivators merely uproot and destroy affected plants. The loss is considerable.

There are several wilt-resistant tomatoes like *Sioux* and *Marglobe* which are already popular in certain parts of India. Another wilt-resistant strain, *Red Top V 9*, has now been evolved at the Department of Vegetable Crops at Davis, California. This strain possesses pear-shaped red berries of tomato, and has given a yield of about 25 tons.

Research institutions in India can try this new strain under their local conditions and assess its potentialities.

Why And How They Build Terraced Fields In China

The V-drag is easy to use

by
Fang Cheng-San

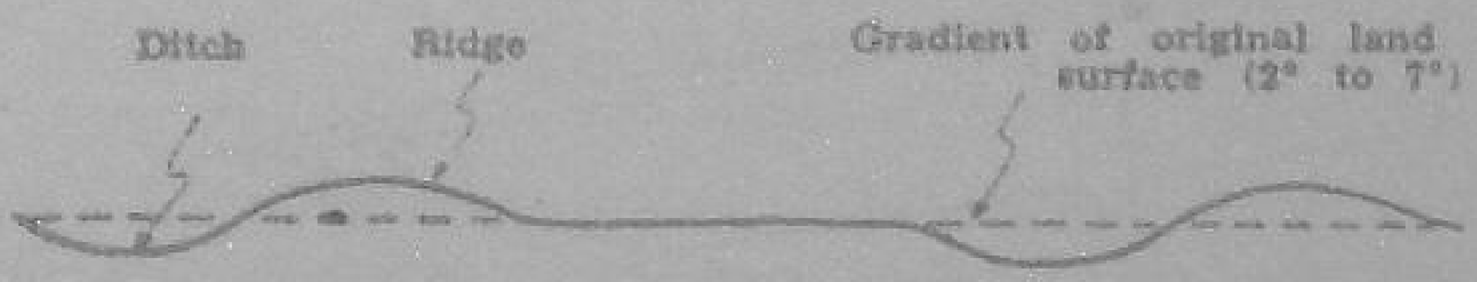
SOIL erosion occurs most frequently on sloping farm lands, and more than half of China's farm land is on slopes. So, building of terraced fields to prevent soil erosion and increase crop output has become a measure of major importance in Chinese agriculture.

Terracing of sloping land decreases the surface gradient, and eventually turns it into level land, or even reverses the direction of the slope. At the same time, it shortens the length of the slope of the field. Naturally, soil erosion is controlled, the crop-yield goes up.

Generally speaking, land with a gentle slope—between two and seven degrees, can be turned into undulating broad-base terraces convenient for mechanized farming. A land surface with a steeper gradient—more than seven degrees, ought to be built into bench terraces or fields terraced like a flight of steps. For a gradient of less than two degrees, contour tillage or strip-cropping are best.

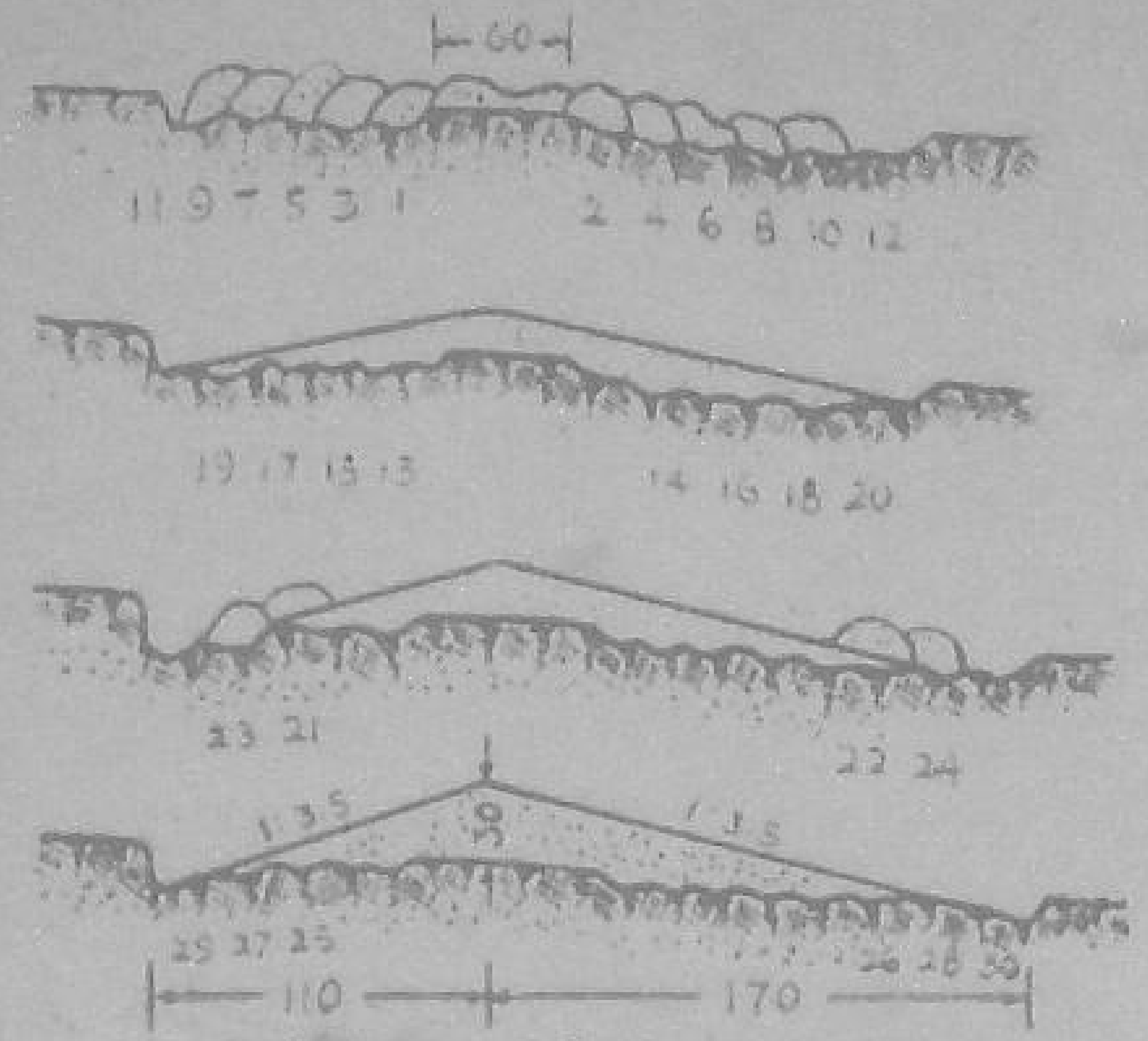
In regions where the annual rainfall does not exceed six hundred millimetres, the water-absorbing capacity of the soil is comparatively good and the gradient two to seven degrees, a level, water-detaining, undulating terraced field for contour farming can be built. The height of the ridges should not be less than 30 centimetres and the breadth of the base about two feet. The distance between two ridges should be adjusted according to the height of the ridges, the gradient, the amount of rainfall and the nature of the soil. With a gradient of three degrees, it should be 15 to 30 metres, with a gradient of five degrees, ten to 20 metres, and with a gradient of seven degrees, seven to 13 metres.

Where the annual rainfall exceeds six hundred millimetres and where the soil layer is comparatively thin and its water-absorbing capacity poor, a grade terrace,



An undulating terrace

or a terrace with an undulating surface, should be built with an inclination of 0.005 to 0.01 degrees for water drainage. In times of sudden, heavy rainfall, the surface run-off may be allowed to drain along shallow ditches behind the ridges at a comparatively slow rate of flow (less than 0.6 metre per second). The capacity of the ditches should be large enough to handle the



Building undulating terraces in four processes

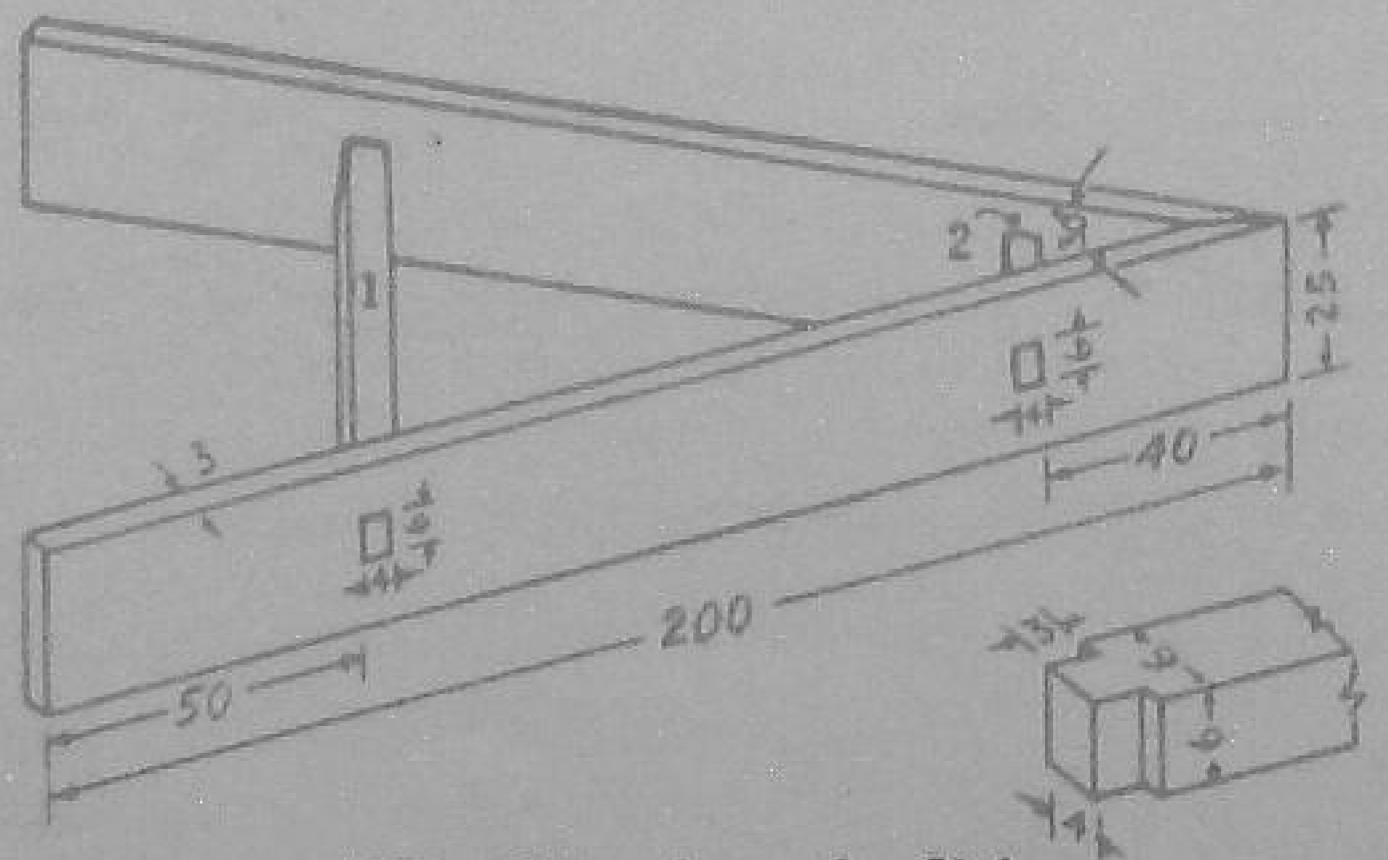
1. Leave 60 centimetres in the centre unploughed, plough 12 times to and fro as indicated, then plough twice in the same furrow on the upper slope.
2. Use V-drag to scrape it to and fro eight times.
3. Plough twice in the same furrow on the upper slope, and plough twice again on the lower slope.
4. Use V-drag to scrape the soil to and fro six times.

surface run-off produced by the biggest squalls that occur once in five to ten years.

SIMPLE APPLIANCES

In building undulating terraced fields, simple appliances such as an ordinary plough and a wooden V-drag may be used. Using animals to work the V-drag in conjunction with the plough gives an efficiency six to eight times that by using shovels manually.

First, plough to and fro across the slope 12 times. Then, work the V-drag to and fro eight times to scrape



The dimensions of a V-drag
(unit: centimetres)

the soil. Then, plough twice in the same furrow in the higher slope, and plough twice again in the lower slope. Use the V-drag to scrape the soil three times each in the higher and the lower slopes. In this way, a ridge with a height of 30 centimetres and a base about 180 centimetres wide is made.

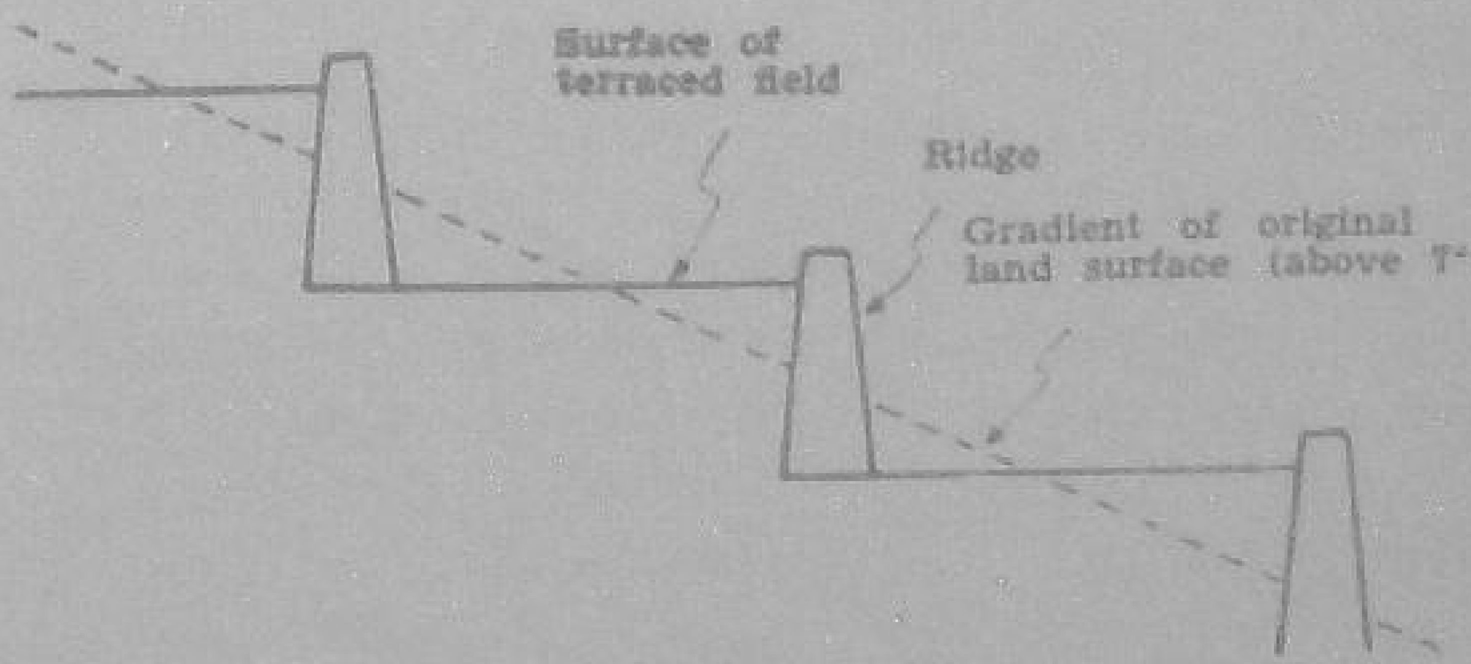
By increasing the number of times and the depth of ploughing and correspondingly increasing the number of times the soil is scraped, the height of the ridge and the breadth of its base can be accordingly increased.

In building undulating terraced fields of a type that will conserve water, in the shallow ditches behind the main ridges build short ridges vertical to the main ones, at distances of 15 metres. These will serve to interrupt and conserve the surface run-off and avoid washing away of the ridges due to concentration of run-off resulting from the unevenness of the ridges.

BENCH TERRACES

Slopes with a gradient exceeding seven degrees should be built into fields terraced in the shape of a flight of steps. The wider the surface of the fields, the greater the amount of earthwork and labour required, and the longer the time required to transform such terraced fields into level fields.

For example, in the hilly area of Tienshui in the north-west province of Kansu, on a slope with a



A bench terrace

gradient of 20 degrees, terraced fields of five to ten and 20-metre width were built. The amount of earthwork required was, respectively, 76, 180 and 146 cubic metres per *mou* (one *mou*=$\frac{1}{15}$ hectare). The time required to transform these terraced fields into level fields was, respectively, three, 13 and 51 years.

Therefore, to save labour and time, the correct determination of the width of the field is a decisive factor. In Szechwan Province in the mountainous south-west,

CONTD. ON PAGE 22

Diet For Diabetics

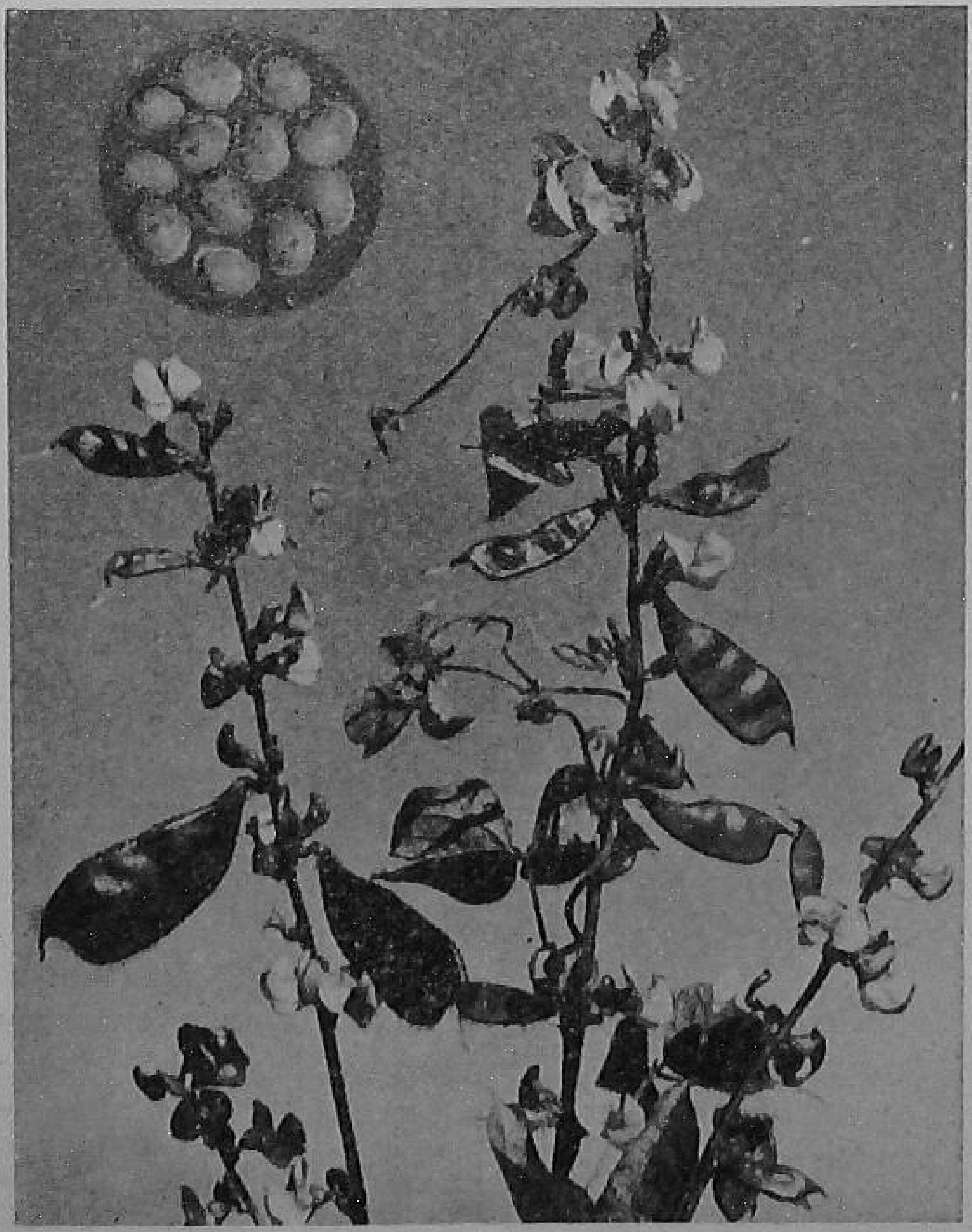
New hope for diabetics comes from the Central Food Technological Research Institute, Mysore. A study of the effects of protein foods on the blood-sugar level and glucose tolerance conducted at the Institute has revealed that casein (milk protein) and protein from tender field beans (*Dolichos lablab*) and black gram bring down the blood-sugar level in a striking manner.

Patients were found to derive similar benefit from diets consisting more largely of skim-milk powder and *iddlis*. The *iddlis* were prepared from pasted black gram (one part) and rice (two parts) fermented into a dough.

Tender beans were more effective than mature ones. A patient who required 20 injections of insulin a day was kept for three months on a diet which included four to six ounces of tender field beans. He took no insulin, yet, throughout this period, there was no sugar in his urine and his blood-sugar level was normal.

—V. Balu

Pods and beans (*inset*) **of** *Dolichos lablab*



Andamans Colonization Scheme

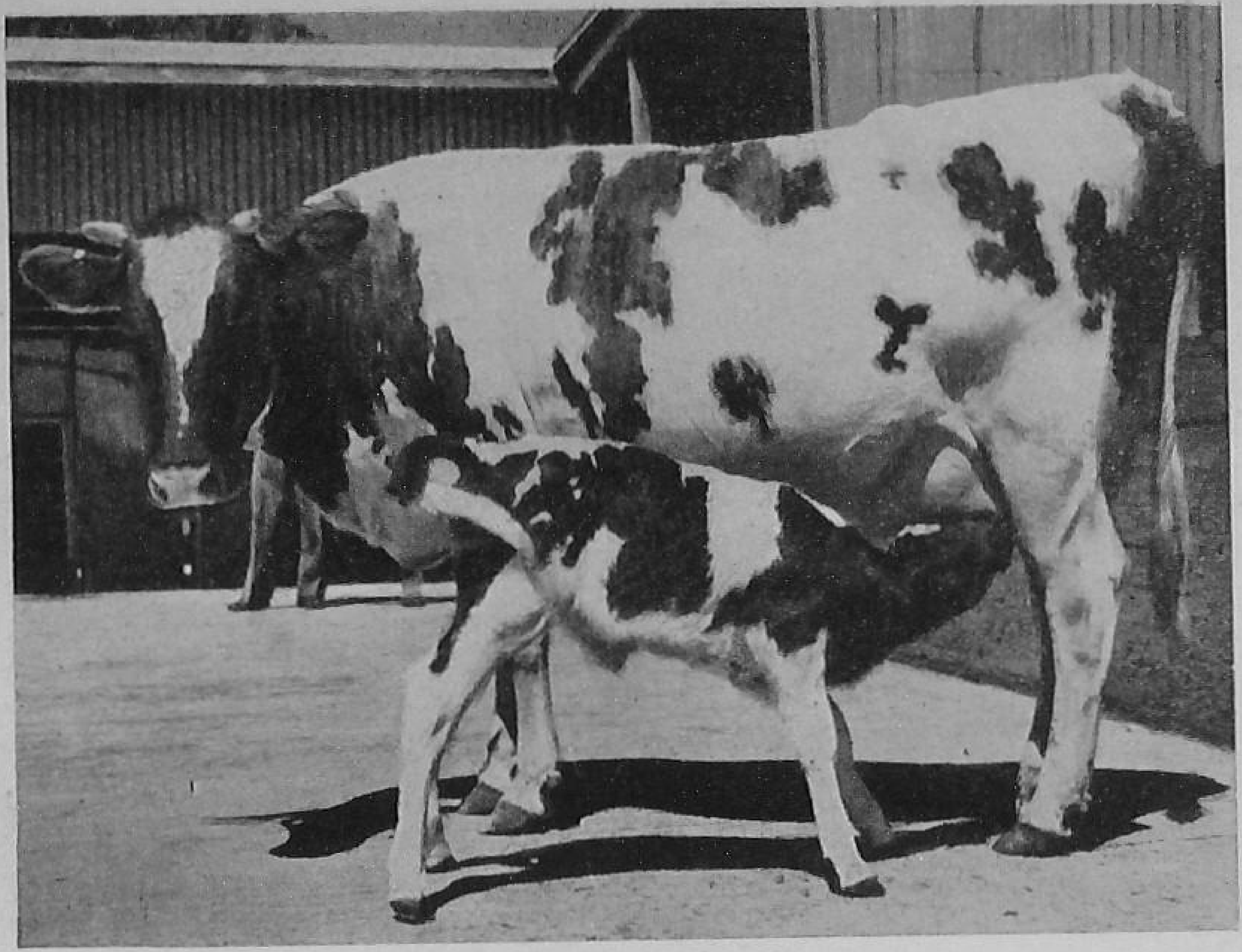
The Andamans and Nicobar Islands' Land Settlement and Colonization Scheme, operating since 1952, aims at clearing 11,500 acres of forest-covered land for resettling 2,594 families by the end of the Second Plan.

Seen here is a family from Bengal clearing the ground at the site of a new settlers' colony.

Fish Breeding Station

The Djoumona Piscicultural Station, near Brazzaville, which is responsible for the development of pisciculture in Middle Congo, Ubangi-Shari and Gabon has become one of the most important in all of Africa south of the Sahara. During the first years of its existence, it has played an important role as the principal centre for restocking of fish in French Equatorial Africa, especially the Middle Congo.

The Station was constructed between 1950 and 1954 and occupies about 55 acres. It has 72 hatching and acclimatization ponds with a total surface of about 11.4 acres. A masonry dam raises the level of the Djoumona river by about 2¼ feet. From here, the water is led to the ponds by a channel 1,500 feet long, with a slope of 0.075 per cent and with a maximum discharge capacity of 3.5 cubic feet per second of which only one-third is generally used.



NEWS and PICTURES

Fyshwick's First A.I. Calf

An artificial insemination scheme for the improvement of dairy herds in the Australian Capital Territory, site of Canberra the Federal capital, was established early in 1958 by the Stock and Agriculture Branch of the Department of Interior. One of the first cows treated was Rainbow, an Ayrshire cross, on "Goldenholm" the property of Mr. Alexander Stuart, at Fyshwick. Rainbow with her heifer calf, which was born on February 24, 1959. The donor sire was Gilmore Hi-Hope, a Friesian.

Night-soil Doubles Yields

Without spending a single pie, students of the Basic Institute at Dongargaon, District Durg, have obtained excellent night-soil manure and doubled the yields from the land attached to the Institute.

They constructed trench-latrines in their spare time at various places on the farm, and put dry soil into them every day to keep them clean. When those trenches became full, they built new ones.

The night-soil manure was ready after six months. By using this manure, bumper rice crops are now obtained from what used to be barren land.

Villagers who did not appreciate the idea in the beginning are now purchasing this manure for use on their fields.

—Shamsuddin

Aircraft In Soviet Agriculture

In the Soviet countryside, planes have become as popular as combines and tractors, and are used for a variety of operations.

A plane used for topdressing can cover 300 hectares per day. When topdressed from the air, the plants are not injured and the fertilizer is distributed uniformly.

Harvesting of cotton by machines is facilitated by first removing the leaves by chemicals sprayed from the air.

Other purposes for which aircraft are used are: weeding, sowing of saksaul—which binds the sand in the deserts, killing field and garden pests, scouting for pastures, and killing beasts of prey which attack domestic animals.

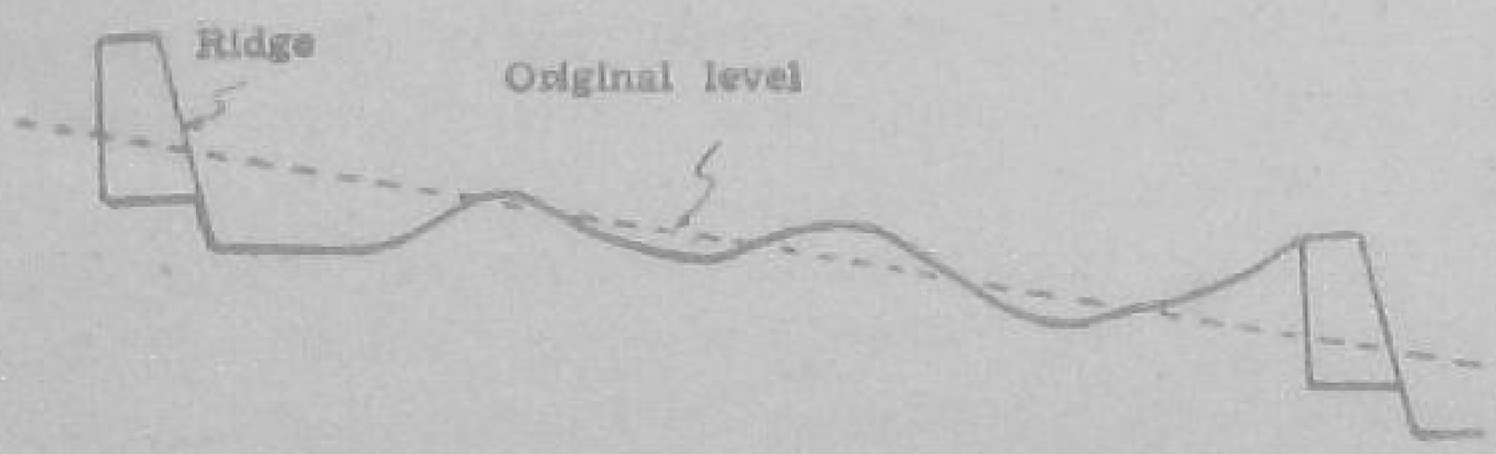
CONTD. FROM PAGE 19

Farming Elsewhere

terraced fields have a long history and are well-built. The width of these fields is generally not great. When the gradient is ten to 15 degrees, the width of the fields is about five to eight metres ; when the gradient is 20 to 25 degrees, the width is about three to five metres. At the same time, the shape of the terraced fields varies with the contour of the land, thus saving labour.

On a field more than 30 metres wide and with a gradient of 33 degrees, at least four more ridges should be built across the slope, thus cutting one terraced field into five strips.

When using animals to till the land, the width of the field should not be less than five metres ; thus, there will be enough room for successful operation and convenient turning. It will also permit operation of a smaller type of tractor with a handle attached. If the width of the surface of the field is too great, not only more are labour and time required to transform the terraced fields



Combining the making of the main ridges with the construction of broad-based low ridges in the building of bench terraces

into level fields, but the higher the field is terraced, the more difficult it becomes for the tractors to go up and down the slopes.

LEVELLING TERRACED FIELDS

Another way of speeding up the levelling of terraced fields is to combine the making of the main ridges with the construction of broad-based low ridges. The levelling of terraced fields depends on: bringing earth downward at annual ploughing and shifting of earth by surface run-off from higher to lower places—thus gradually levelling down the surface of the field. The bringing or washing down of more earth from a higher place cuts down the time required to level the layers of the terraced fields.

Broad-based low ridges are constructed on the surface of the field with a two-way plough for ploughing hillsides, and a V-drag, while making the ridges higher every year. In the construction of broad-based low ridges, the earth on the prominent part of every broad-based low ridge is scraped from up downward. It is thus possible to expedite the levelling of the layers. In addition, since the original topographical gradient is comparatively great, six months or a year of rain will wash the earth on the prominent part of broad-based low ridges down, further accelerating the levelling of the gradient.

By using this method, the time required to level the layers of terraced fields can be halved. For example, in the Tienshui area where slopes with a gradient of 20 degrees are built into terraced fields with a width of ten metres, 13 years would be required to make them level, according to the original schedule. But when the method of combining the making of ridges and the construction of broad-based low ridges is used, this time is cut by six or seven years. Further, after constructing broad-based low ridges, the run-off is checked section by section on the surface of the field, making the amount of moisture held by the soil comparatively even. This is also favourable to crop growth.

Only by not making the surface of the terraced fields too wide and by combining the making of ridges and the construction of broad-based ridges is it fully possible to build slopes with bigger gradients into levelled bench terraces in a comparatively short time.

SECOND
ALL-INDIA MANGO SHOW
(Northern Zone)

The Second All-India Mango Show for the Northern Zone will be held at the Community Hall, Panchkuin Road, New Delhi, from 12th to 15th July, 1959.

Entries will be received up to 12th July at New Delhi.

For further particulars and copies of the Schedule, apply to the Secretary, Indian Council of Agricultural Research, New Delhi, or the Horticulturist of your State.

Things You Should Know About Bee-keeping

by
K. C. Chandy

BEE-KEEPING is an interesting as well as a profitable hobby. The farmer is specially suited for it, and can take it up in his spare time to supplement his income. But before he does that he would do well to know a few important things.

The best season for starting an apiary is when there is profuse flowering of bee-pasturage plants like cotton, *neem*, tamarind, Gliricidia, *moringa*, *cumbu* and maize. The equipment required is: hives, "queen gates," queen excluder sheets, foundation combs, dummy division boards, bee-escape boards, uncapping knife and honey extractor.

Apis indica is the common honey-bee used. An average colony consists of 20,000 to 25,000 individuals. During a favourable season, about 90 per cent of these comprise workers, which are small, infertile female bees. The workers attend to the collection and storage of nectar and pollen, construction of combs and nursing of grubs. They are provided with stings as a weapon for offence and defence. The prosperity of a colony depends on the industry of these workers.

When the season is favourable, there are also a number of males, known as drones, having dark and stout bodies. They are stingless, and their only function is to mate with the queen once in her lifetime.

The most important member of a colony is the queen—the only fertile female. It is the biggest bee in a colony, and has a stout and long abdomen. Normally, a colony is headed by a single queen. The strength of a colony depends on the egg-laying capacity of the queen.

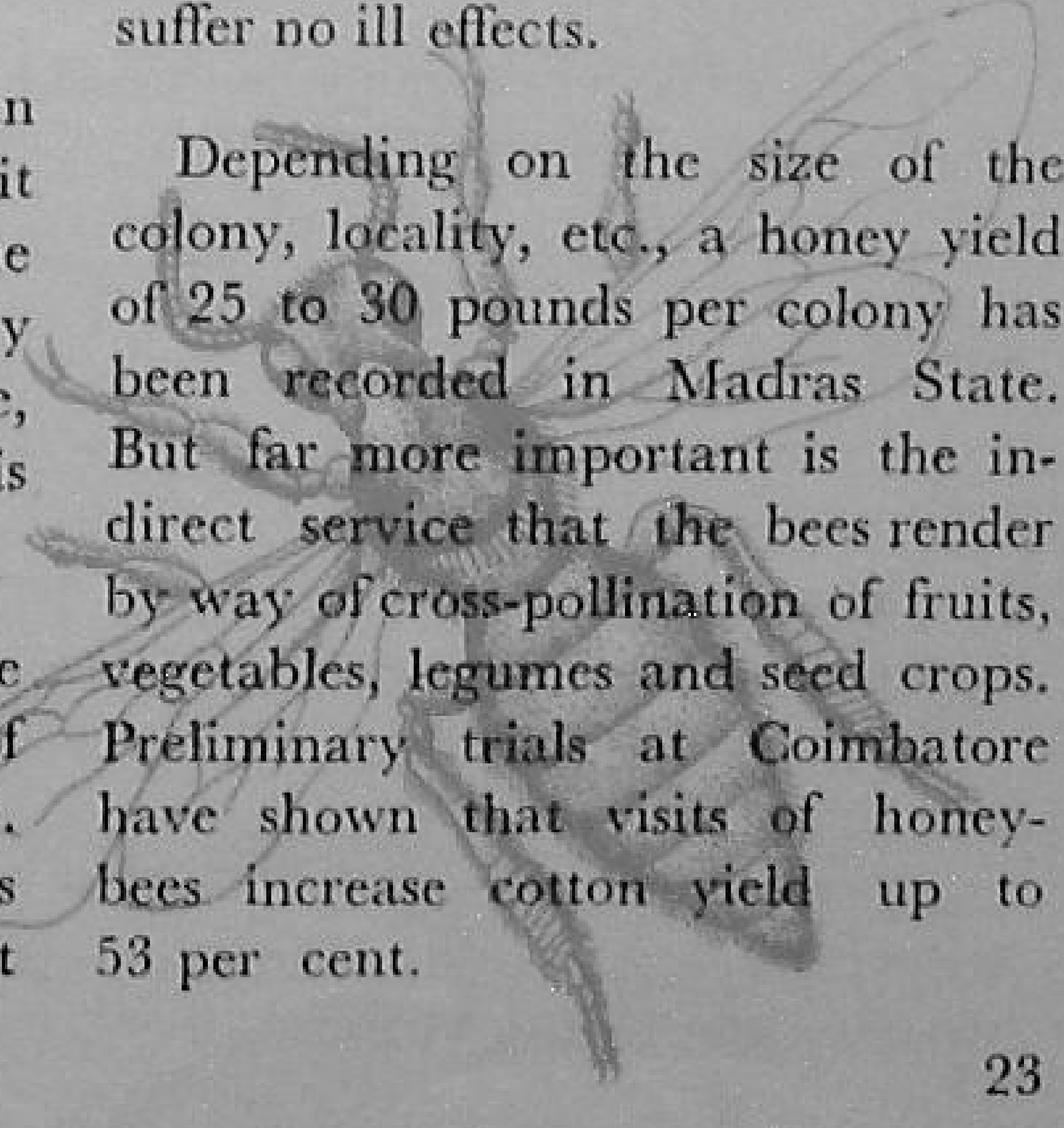
To start bee-keeping, spot a wild colony or swarm and hive it in an artificial hive. Transfer the combs with the bees carefully from the nest to the frames of the hive. The combs with eggs and grubs should be gently removed and fixed to the frames with the minimum injury to them and the least disturbance to the bees.

If possible, spot out the queen and transfer it to the hive first. If it is difficult to locate her, transfer the bulk of the bees to the hive; if they are then observed entering the hive, it is an indication that the queen is inside.

After the majority of the bees have gone into the hive, close the top of the hive and leave it there till dusk. After dusk, shift the colony to its permanent place. Better keep it in a place well-protected from the midday sun and strong wind, say, under a shady tree or in a thatched shed.

The newly hived colony is not to be disturbed for a week. Till the colony has settled down, prevent the queen from getting out by fixing a queen gate at the hive entrance, which allows only the workers to pass through. If bees are seen returning to the hive with loads of pollen, it is a sure sign that the colony is settling down. After a week, examine the colony to note its progress.

Some people are extremely sensitive to the bee-sting, or nervous, and may find bee-keeping difficult. But most persons develop immunity to the poison in course of time and suffer no ill effects.



Depending on the size of the colony, locality, etc., a honey yield of 25 to 30 pounds per colony has been recorded in Madras State. But far more important is the indirect service that the bees render by way of cross-pollination of fruits, vegetables, legumes and seed crops. Preliminary trials at Coimbatore have shown that visits of honey-bees increase cotton yield up to 53 per cent.

Farm Flashes

Two maunds of superphosphate to an acre of *lahi*—a type of mustard grown in the terai areas of Uttar Pradesh, increase yield by about 24 per cent, which means an approximate extra profit of Rs. 18.

Flowering and maturity are also hastened, thus saving the crop from untimely frost.

HEATING milk to 60°C for ten minutes and exposure of infected materials to direct sunlight for a few days will destroy brucellosis organisms. If an abortion has occurred, the discharges, afterbirth and the foetus should be buried deep after treating with an antiseptic, or burnt on the spot.

When a new animal is added to the herd, its serum should be tested.

FOR success in betel cultivation, do not allow stagnation or too much water within the root range. In alternate rows, provide channels to serve both for watering and for drainage.

STORING *gur* in pukka godowns and then "smoking" it has proved to be a good way of preserving its quality in storage.

The smoking is done behind closed doors with smouldering paddy husk, which raises the temperature of the godown. In the rainy season, smokings are given at intervals of about 15 days; on the whole, 16 smokings a year are required.

The "smoky" odour of the *gur* disappears after exposure.

IN COCONUT plantations in East Godavari district, intercrops such as turmeric, banana, ginger, *Colocasia* and yam are being raised. They are highly remunerative and compensate for the cost of cultivation in the early stages; besides, the tillage, manuring and irrigation given to them do the young coconuts good, keep the land free of weeds and improve the aeration of the soil.

But up to the 15th or 20th year, only shade-loving crops like ginger can be grown.

METALDEHYDE baits and dusting of infested plants with one part lead arsenate and five parts slaked lime give a good control of garden snails. Lime, soot, wood ash, etc., spread on the ground act as good deterrents.

COCONUT husks are rich in potash—the most important manurial requirement of the coconut palm, and help retain moisture in the soil. Bury them between coconut rows in trenches six feet square and one foot deep, with the concave sides facing up. Put in some farm rubbish over a layer of dry coconut leaves. Then fill in properly with soil.

Their beneficial effect lasts about eight years.

DIETS rich in animal proteins render poultry birds fairly resistant to roundworms; diets of plant proteins make them more susceptible to them. The Piperazine compounds are a good antidote, and can be administered in drinking water.

A NEW, long-lasting, liquid fertilizer known as UN-32, with a high nitrogen yield, has been developed in the U.S.A. It contains 35 per cent urea and 45 per cent ammonium nitrate. UN-32 has no pressure, no volatile ammonia, and contains 32 per cent nitrogen. It can be applied through foliage as well as through the soil.

"DAMPING OFF" of chilli seedlings can be controlled by thinning, good drainage and judicious irrigation in the nursery. Any copper compound in solution is also helpful.

Palanivelu gets his vines sprayed

One Acre Under Grapes, A Steady 7,000 A Year

WITH one acre under grapes, Shri K. Palanivelu of Kamayagoundanpatti in Madurai district of Madras State is making a steady income of at least Rs. 7,000 a year. How? This he told me when we met at his vineyard recently.

He grows mainly the *Kishmish* variety. It was in demand, he informed me, because its supply depended on imports; so it fetched a good price. He sends his produce directly to cities like Madras, Madurai, Coimbatore and Tiruchy.

Then, he manures his vines well. Twenty days prior to pruning, he applies 224 pounds of horn and hoofmeal; after pruning, he gives four cartloads of sheep manure. He prunes the vines twice a year.

He sprays DDT on the vines soon after pruning to keep pests away, and wards off the leaf spot disease by spraying Bordeaux mixture whenever the weather shows signs of being unkind.

But on top of all is his method of staggered pruning. He has divided his vineyard into four blocks. Each block is so pruned as to induce bearing at four different times of the year.

"This is an insurance against crop failure," he explained to me the advantage of this system. "If there is rain at any time, only one block, and not the whole crop, is affected. Besides, the produce from a late crop sells at a premium. Doesn't it?"

—H.K.S.

* * * * *

EXPLOITING INDIA'S FORESTS

QUITE a number of forest products provided by India's forests feed modern industries, earning lakhs of rupees annually; and some, like sandalwood, are even valuable items of international trade. In 1954-55, minor forest products worth Rs. 7.73 crores were produced.

A provision of about Rs. 20 crores exists in the Second Five Year Plan for the forestry schemes of the States and Union Territories. It is sought to achieve the objective of 33.1|3 per cent forests spread over the country, planting for firewood supply on a large scale to relieve pressure on cow-dung consumption and meeting the acute shortage of timber, by implementing programmes such as farm forests and extension forestry, economic plantations and their profitable exploitation, forest consolidation, forest resources survey, rehabilitation of degraded forests, grazing and pasture improvement, development of minor forests' produce, better timber operations and forest utilization, development of forest communications, research, and training of staff.

Compared with countries like the U.S.S.R. and the U.S.A. with per capita forest area of 3.5 hectares and 1.8 hectares, respectively, the present per capita area under forests in India is very low, being only 0.2 hectares. Not only is the forest area proportionately smaller in India, but it is also unevenly distributed, and the forest yield is substantially low.

"A PRECIOUS GIFT FOR MY WIFE"

For years I had been striving to save, but the meagre profits from my crops made it hardly possible. Year after year, harvests were poor for lack of abundant water. Then it happened suddenly. I managed to get a Cooper horizontal diesel engine and pump through the Government Taccavi Loan. Now there is abundant water and my crops have multiplied threefold. I have money to put by for the future. At last my dream of building up savings against the future has become a reality. My wife has called it the best gift I could give her.

Cooper horizontal diesel engines come in various models of different ratings and speeds. All castings are of meehanite high-duty iron. Because of the slow speed these engines last long and make for economical operation.

Portable vertical engines also available.

Cooper diesel engines are approved by the Government, for sale through Taccavi Loans.

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CE. 58 9 EVEREST

'PHENOVIS'

Every sheep breeder knows that even when feeding on good monsoon grass his sheep often get thin and sometimes die. This is due to lakhs of very small worms that suck blood from the gut and so make the sheep weak.

Treatment with 'Phenovis' four times a year will control these worms. The first dose should be given just before the monsoon, the second and third doses should be given during the monsoon, and the last dose should be given one month after the end of the monsoon. Your veterinary doctor will show you how to give the drug.

Ask your Veterinary Doctor

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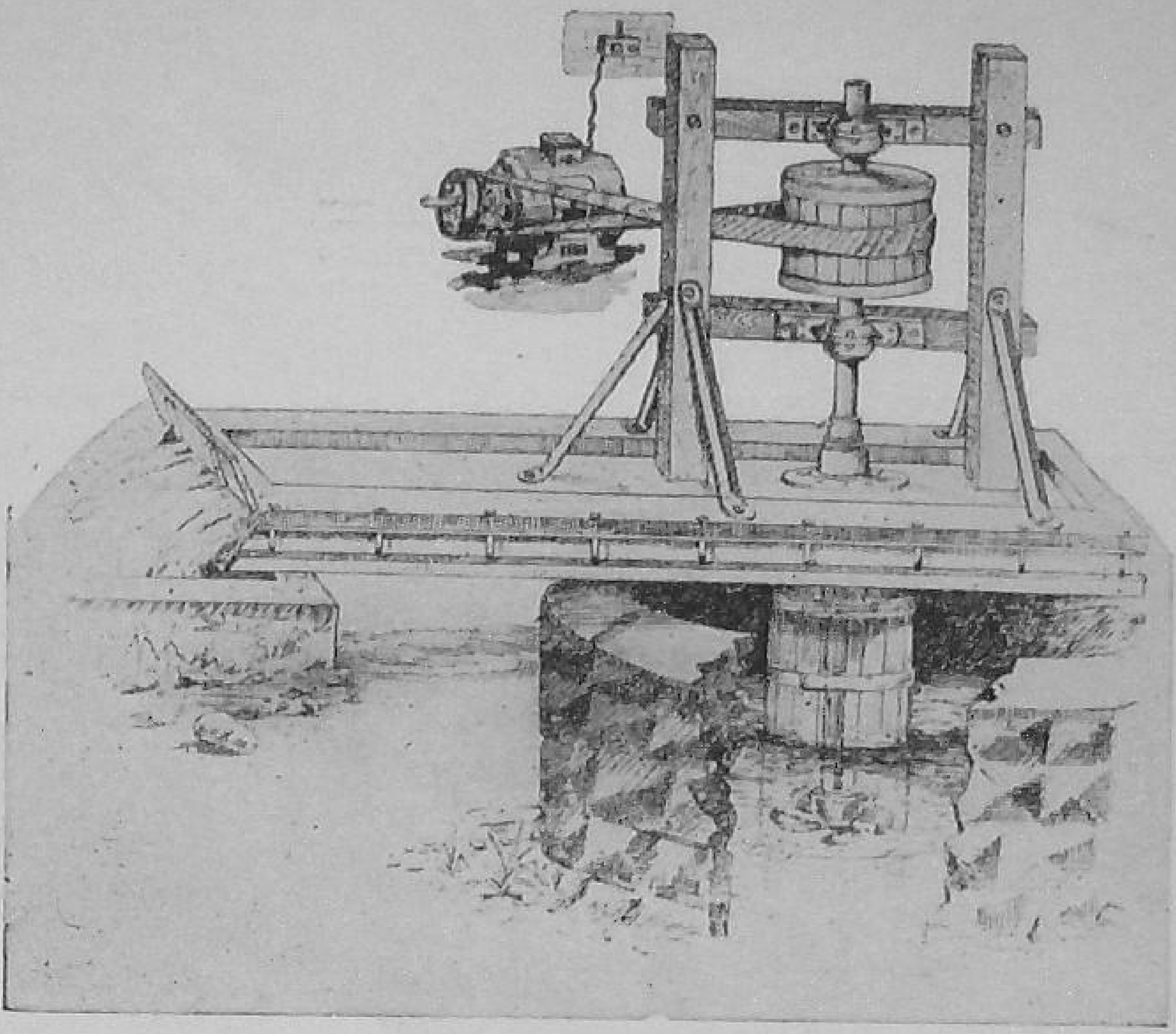
ICV/447

New Pump Solves Water-logging Problem

by
S.V. Parthasarathy
Chief Sugarcane Officer
Vadapathimangalam, District Tanjore



This is how the TAS pump works

THE general belief among the farmers of the Tanjore delta of Madras State that sugarcane cultivation is not suited to the belt, no longer holds good. At least 6,000 acres in the area, going by the name of Thiru Arooran Sugars Cane Farm, now feed a thriving sugar factory. A systematic tackling of the drainage problem, in which a new type of drainage pump has played the major role, has brought about this change.

How serious the water-logging is in this tract can be seen from just one example. When the Farm was started, the per-acre cane yield in a 588-acre village, Sathangudi, was as low as three to four tons. In fact, the crop did not come up at all in many fields, and marsh grasses and *Spontaneum* dominated. Today, the same fields are bearing excellent 30-ton crops !

After the introduction of *Co.* canes, sugarcane cultivation has extended to odd places typical for drought or water-logging. Sugarcane loves moist soil and, to some extent, can tolerate moving water, but not marshy or ill-drained conditions. In South India, particularly in Madras and Andhra States, it is rotated with paddy—a crop that thrives under the opposite conditions; consequently, it suffers heavily.

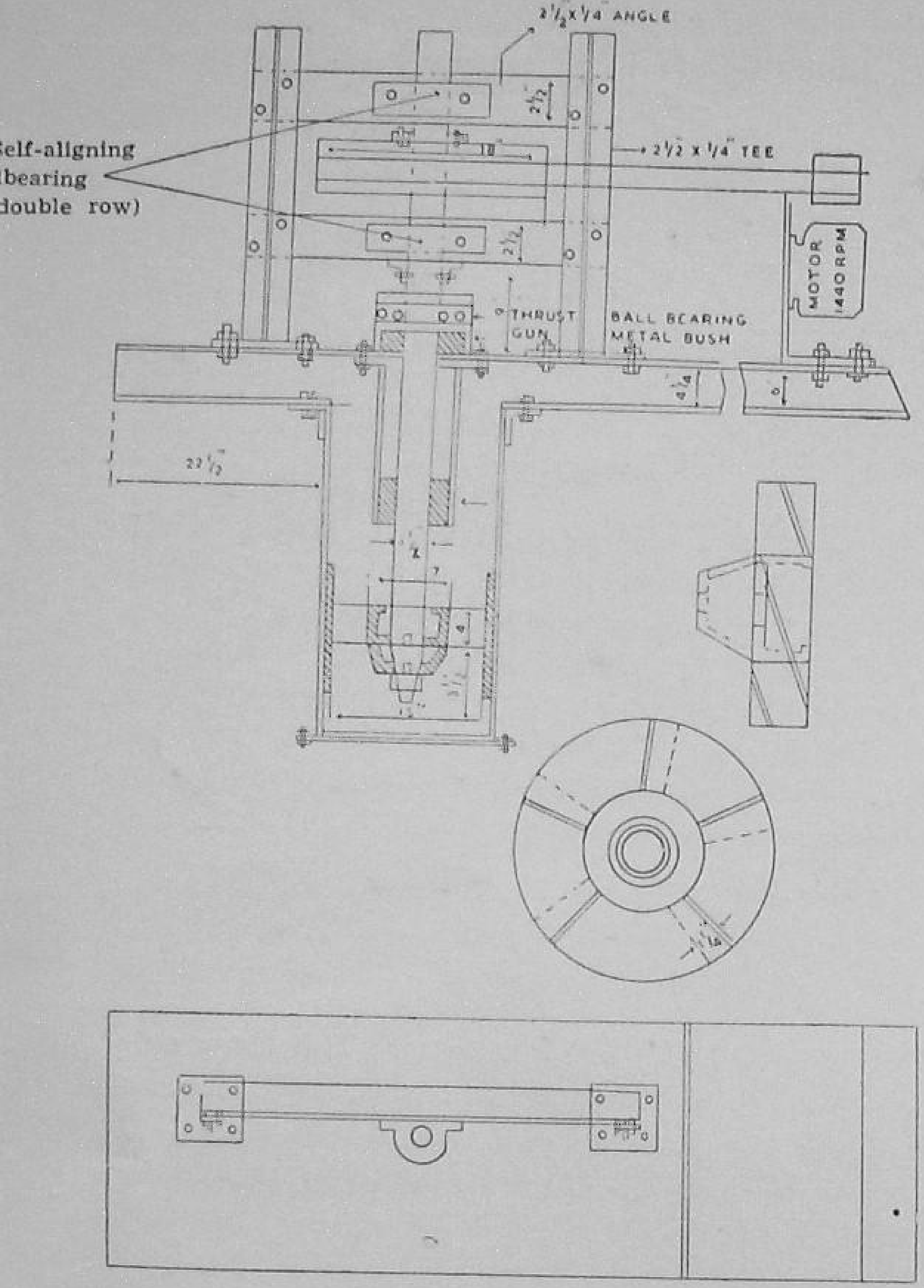
Rice is the main crop of the Tanjore delta. For about eight months in the year, the Cauvery water feeds the canals. The country, particularly the eastern delta, is flat, with a fall of two or three feet per mile ; the soil is heavy clay up to a 100 feet or so. This topography and soil offer little scope for surface or subsoil drainage of water.

The irrigation system also is peculiar in that the same channel serves for drainage at a higher level and for irrigation at an immediately lower level. Again, the irrigation water does not flow into the fields unless headed up by cross-bunding to a depth of 1½ to two feet. This peculiar system is suited to rice cultivation, but not to cane. The ill-drained condition of the fields for over eight months and dry fallow for about four months, with deep soil-cracks in summer, have led to salt deposits in the soil. Consequently, there is no aeration and root-development is shallow.

HOW TACKLED

The flatness of the land offering little scope for gravitational surface drainage and there being extensive pockets of 100 to 400 acres forming almost water-logged basins with one to two feet of standing water round the year, all such blocks in the Thiru Arooran Farm were first heavily ring-bunded to prevent entry of outside water except rainfall and through the irrigation sluices. The entire area was then split up into convenient smaller blocks of 50 to 100 acres and each sub-block bunded up and protected.

The second step was to open up big drains round the blocks at intervals of 400 to 500 feet to catch the drainage water. Through these drains, the water flows down to a common point and is eliminated if the



Construction details of the T.A.S. pump

level permits. By inter-connecting all the drains to a common point, it is possible to take up the drainage of any particular block while keeping that of others closed up temporarily. This is very important, because the urgency of drainage in the different blocks depends on the age of the crop.

The sugarcane crop is more susceptible to water-logging in the first three or four months of its growth; from four to nine months, it is somewhat tolerant, and beyond that age is helped by it in maturity. When water is withdrawn after prolonged stagnation, the mature crop deteriorates more rapidly than it would otherwise.

PUMPING

It was found that in most cases, the drain water could not empty itself gravitationally. Therefore, pumping became a necessity. In the first season, four centrifugal pumps with a total capacity of about 40,000 gallons per hour were fitted. They could clear up two acre-inches per hour, or one foot of flood-water over an acre, in six hours. Working round the clock, only four acres could be cleared in a day ; in a week, only about 30 acres could be handled. Certain other difficulties were also met with in working them long hours.

A new type of axial flow pump was, therefore, fabricated to meet the situation. It is an adaptation from the axial flow, low-lift pump used for draining four to six feet of stagnant water from rice fields in the Kuttanad area of Malabar State.

SIMPLE DESIGN

The TAS (Thiru Arooran Sugars) axial flow pump is simple in design : a wooden cylindrical drum 24 inches in diameter and seven feet long. The diameter of the cylindrical drum can be varied from nine to 36 inches according to the quantity of drainage water to be lifted and drained. At the top of this drum is a horizontal outlet 12½ feet long, two feet eight inches broad and eight inches deep. A shaft is fixed vertically in the drum and held in position by a thrust bearing. At the top of the shaft is a pulley and the shaft is held in position by a wooden framework. At the lower end of the shaft is a propeller-head with vanes fixed at definite angles and adjusted to be in contact with the drain water.

The wooden pulley is connected to the pulley of a motor through a belt. When the motor is worked, the shaft of the pump rotates at 450 revolutions per minute. The propeller drives the water up the drum and then out along the outlet box. For a head of about three feet, the total quantity of drain water lifted is nearly two lakhs of gallons per hour for a 24-inch drum. The horse-power of the motor is 20.

The following figures show the capacity of such a pump which can lift 2,00,000 gallons of water per hour.

Acre-inches	*Area drained (in acres)*	*Period required (in days)*
2	212	2
2	424	4
2	336	6
4	106	2
4	212	4
4	318	6
6	71	2
6	141	4
6	212	6

The damage to crops from ill-drained conditions is as great as from drought. Even in the case of rice,

CONTD. ON PAGE 34

Lest Your Hens Should Refuse to Lay Eggs

by
Y.P. Neb
Assistant Poultry Development Officer
Ministry of Food and Agriculture
New Delhi

WHEN hens look unlively, show lack of interest in the feed and huddle up in corners, instead of cackling and flocking around the nest-boxes, take it that all is not well with them and a fall in the egg production will follow.

A slump is indicated when the per-bird egg production falls below 15 in January and February ; below 18 in March ; below 15 in April ; below 8 in May and June ; below 12 in July and August ; below 9 in September ; below ten in October and November ; and below 12 in December. This may be due to various reasons.

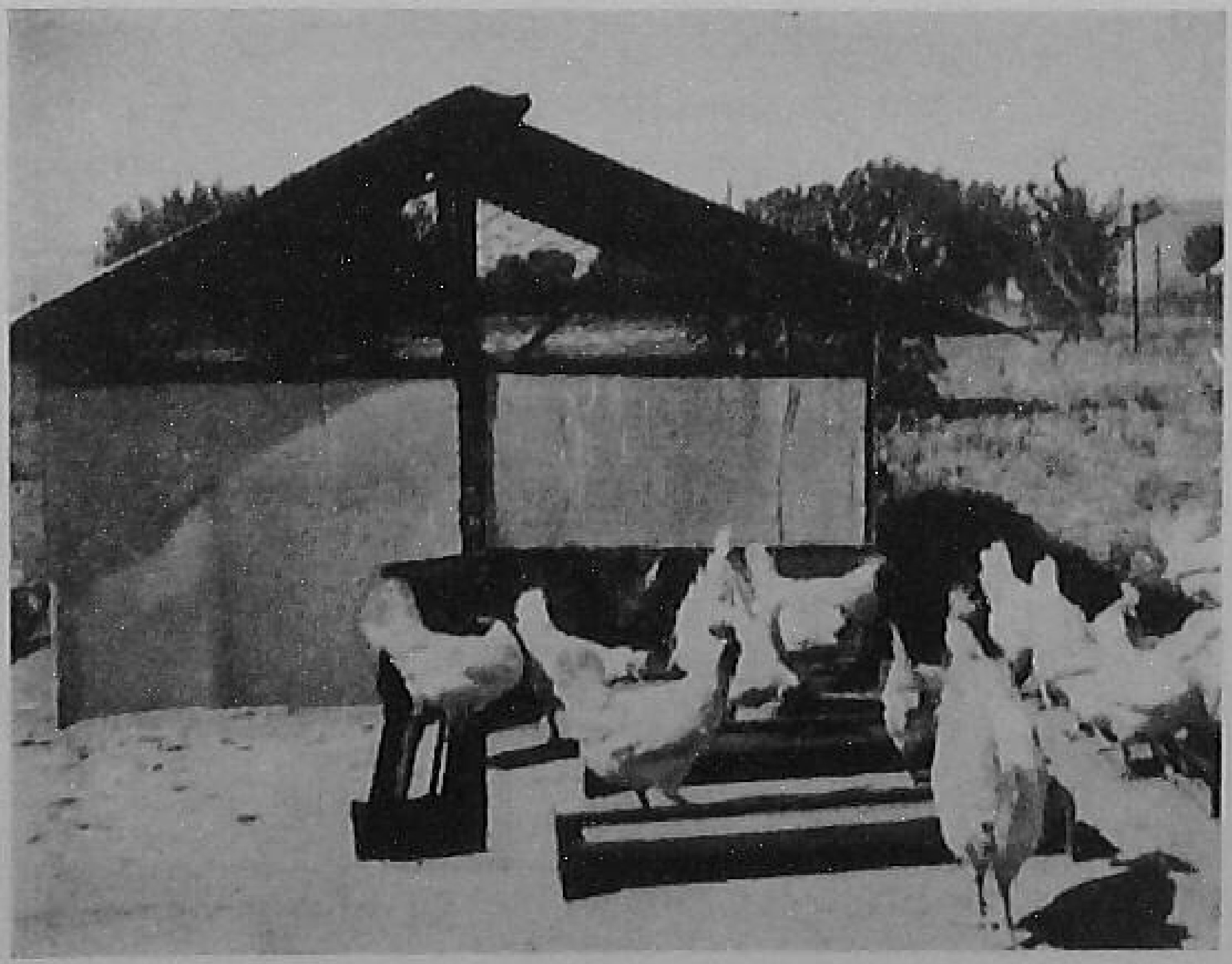
By far the most important single factor is improper feeding. Deficient and ill-balanced rations, as also insufficient feed, cannot maintain egg production at a steady level. Too few feeding hoppers, allowing less feeding-space, are another cause.

SEASONAL CHANGES

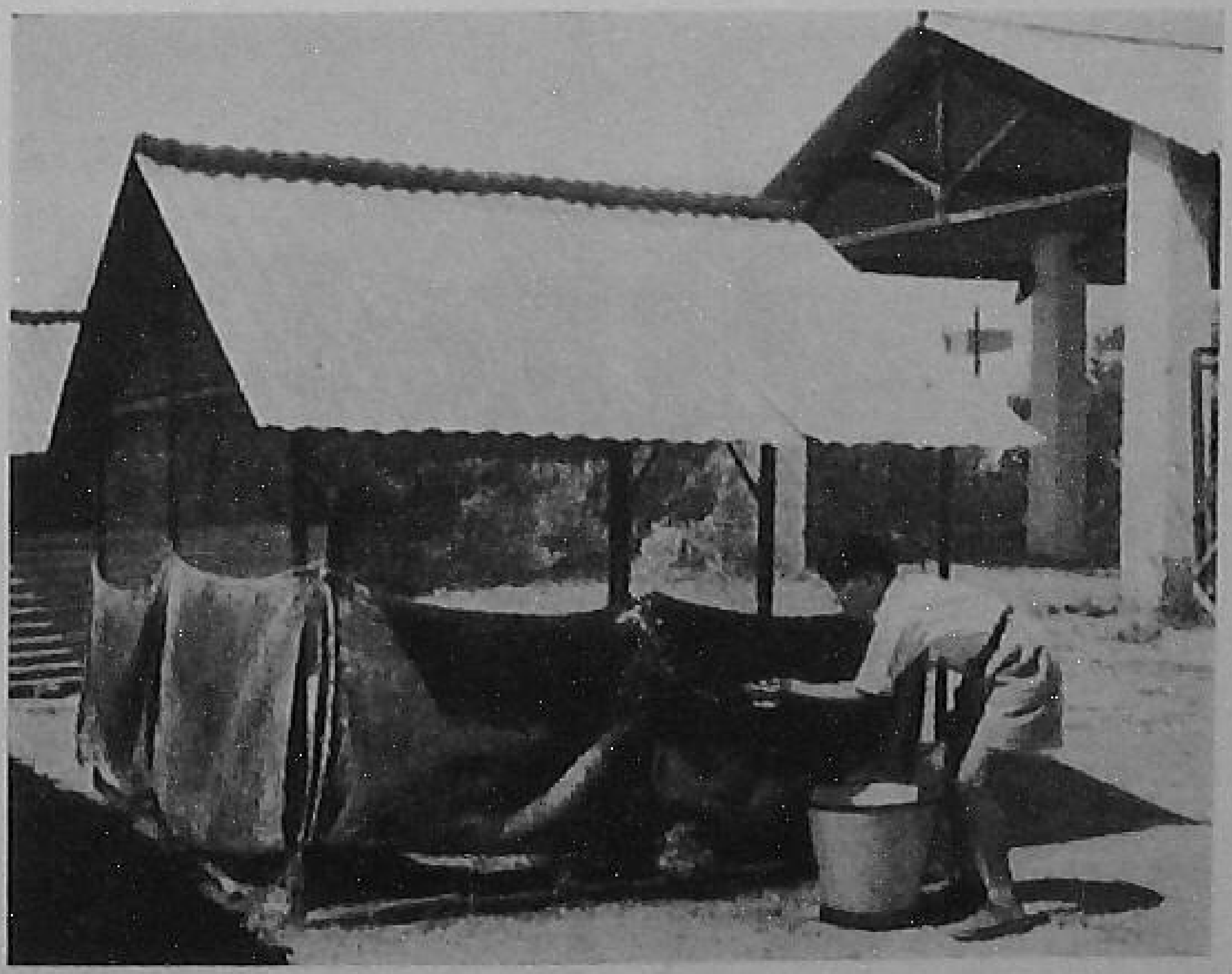
In northern India, it is extremely hot during May and June, and birds suffer greatly from hot and dry winds. Shading the runs by growing shady trees or erecting temporary shelters ; spreading sand in the poultry-houses and sprinkling cold water over it in the morning ; providing thatch or gunny curtains on the sides of the poultry-houses ; and supplying plenty of cool, fresh water, fresh succulent green feed and liberal quantities of buttermilk and separated milk to the birds, provide them good relief.

During the cold season—from mid-December to mid-February, the birds need to be protected from cold draughts and low temperature. This may be done by providing gunny curtains on the windows at night, supplying fresh tap-water in the morning and plenty of high-protein feeds like meat offal at one-half to one ounce per bird at noon. Spreading dry litter in the house is a good way of providing warmth to the birds. Use of artificial light to give the birds a 12-hour day induces better laying. Under no circumstances, however,

G.I. sheets fixed on the sides of poultry-houses protect the birds from cold draughts



Gunny curtains sprinkled with cold water keep them cool in summer



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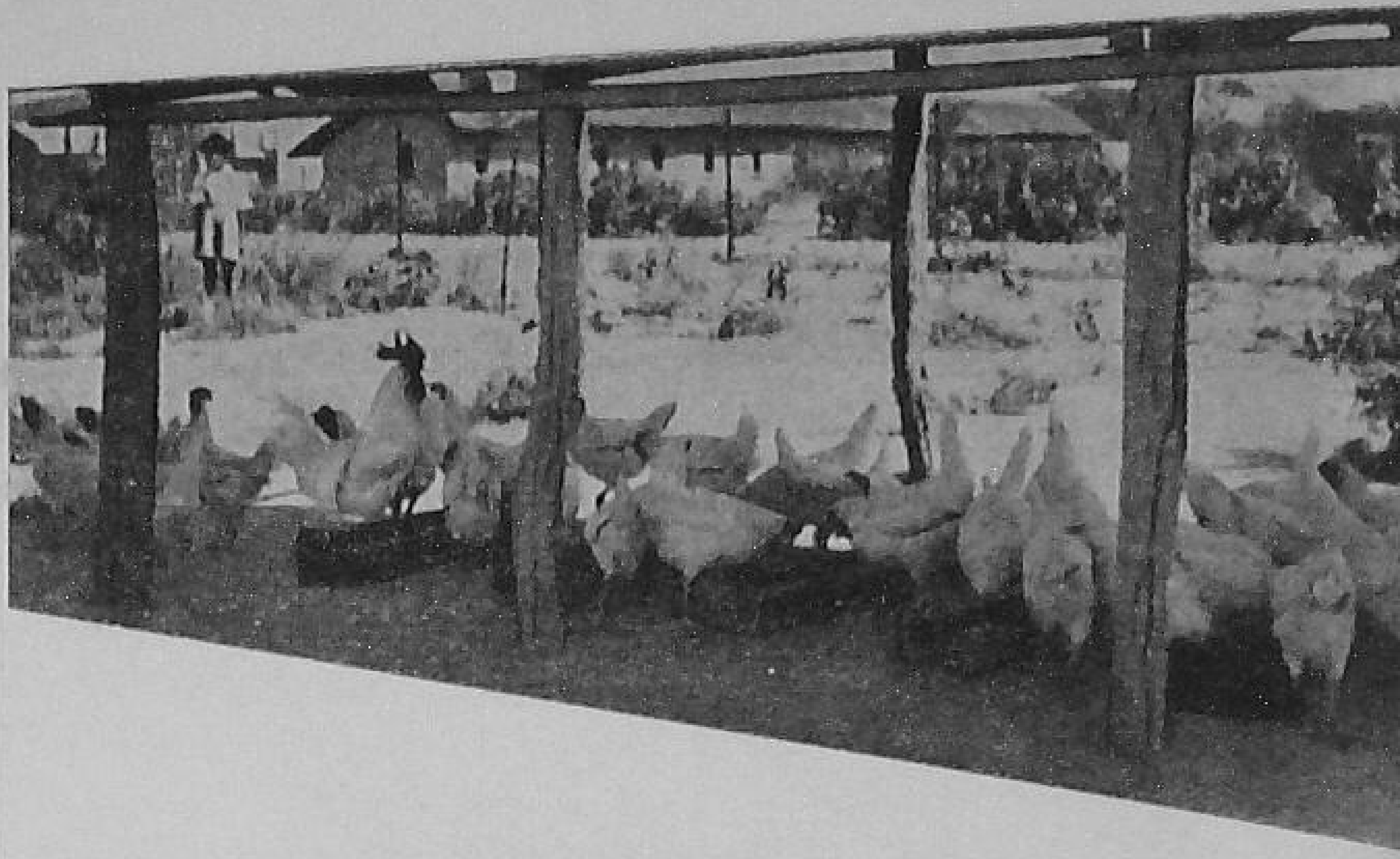


If no tree-shade is available, set up temporary shelters as this

should the houses be made unduly stuffy.

DISEASES AND PARASITES

If all birds are protected against infectious diseases like Ranikhet and fowl-pox at the age of four to six weeks as a matter of routine, then only ticks and lice and certain internal worms and coryza remain as the main problems. Ticks and lice can be controlled by: dusting the birds with D. 025 "Gammexane," weekly or fortnightly, or by adding it to the dust-bath ; blow-lamping the poultry-houses weekly ; injecting the birds with 10,000 to 20,000 units of procaine penicillin at the first symptoms of tick fever.

Internal parasites such as roundworms and tapeworms can be controlled by proper sanitary measures and periodical deworming with "Phenothiazene" at 0.5 gm. per pound of live-weight.

The dreaded infectious coryza is easily warded off with 40,000 units of strepto-penicillin, provided the disease is detected early.

MOULTING

The most important physiological factor affecting egg production is moulting, which takes place every year. To help the birds withstand the strain and allow only a minimum unavoidable fall in production, a well-balanced, nutritious mash containing one per cent shark-liver oil ("Veterinary" brand with vitamin D_3) should be fed at five ounces per bird per day. A liberal supply of buttermilk and calcium grit also does them a lot of good. The best solution, however, would be to evolve, by careful breeding and selection, a flock of predominantly late moulters and persistent layers.

If egg production continues to go down in spite of all the care given to the flock on the above lines, then it is clear that the laying flock lacks the stamina to withstand the strain of heavy production. Then the remedy is to get the stock bred for high production.

OF about 300 *boro* paddies tried at Chinsurah, the non-scented *Chinsurah boro-1* and *Chinsurah boro-2* and the scented *D.A.-5* have been found to suit West Bengal best. Another advantage with these varieties is that they can be grown both during the *boro* (spring) and *kharif* seasons; their average yield is about 27 maunds during *boro* and about 25 maunds during *kharif*.

The trials with *boro* varieties collected from within West Bengal as well as from outside the State, and East Pakistan, were conducted under a scheme sponsored by the Indian Council of Agricultural Research.

Some of the recommended high-yielding *aus* varieties were also grown during the *boro* season to study their performance; *Kele*, *Jhanji-34*, *Satika*, *Ashkata* and *Bhutmuri* seemed to do quite well and gave an average 20 to 24 maunds per acre. Some early *aman* paddies are also being similarly tried.

Boro paddy is grown in the low-lying areas of West Bengal which do not dry up in winter, and where no other crops can be successfully grown. It is sown in seed-beds late in October or early November, transplanted in December-January and harvested in April or May.

In West Bengal, *boro* paddy has remained almost neglected, probably due to its coarse grains and the

A *boro* paddy field at the Chinsurah Research Station

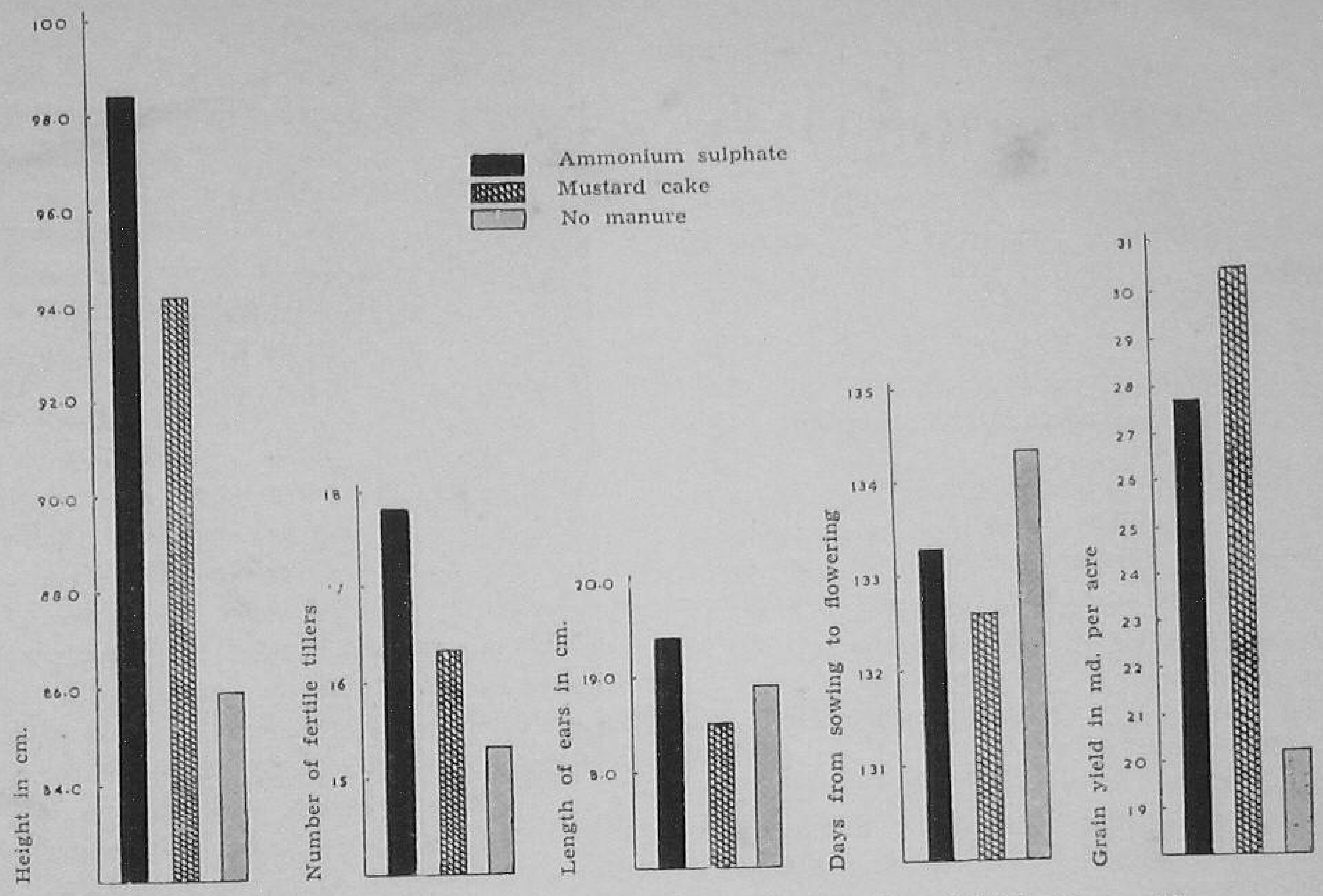
Chinsurah boro-1—one of the recommended varieties

BENGAL'S BORO PADDY TOO RECEIVES ATTENTION

by
B.N. Ghose
Rice Research Station
Chinsurah

pressure on land. Of the total paddy acreage of ten million, only 44,163 acres are under *boro*, the total outturn of clean rice being about 18,000 tons. Transplanting is in vogue; usually, 45 to 55-day old seedlings are transplanted, taking care that they are not submerged in standing water.

A preliminary study at the Chinsurah Station during 1952-53 showed that the best time for planting *boro*



Effects of organic and inorganic manures on the growth and yield of *boro* paddy. Note the highest yield obtained with organic manure (mustard cake)

paddy is from the end of December to the middle of January; the yield is reduced if planting is delayed. The closest spacing, i.e., four inches both ways, gives the highest yield, six inches is the next best, and nine inches gives the lowest yield.

EFFECT OF FERTILIZERS

Very little work on the effect of different fertilizers on the growth and yield of *boro* paddy has been done in West Bengal. A preliminary study with nitrogen at 80 pounds per acre has been made at the Station. With ammonium sulphate, the increase was 36.6 per cent over the "no manure" treatment, while it was 50.5 per cent with mustard cake. The plant height, number of tillers and the length and breadth of the flag were higher in manured plots, the response being the greatest with ammonium sulphate. The effect of potash and phosphate is yet to be studied, as also other doses of nitrogen.

Generally, the grains of *boro* varieties are coarse and red. In order to improve the quality and yield, hybridization work with high-yielding varieties of *aus* and *aman* paddy has been started, and some promising selections of *boro* made.

PESTS AND DISEASES

Of the many diseases and pests that affect rice, only a few are met with in *boro* paddy. The seedlings often suffer from the *Helminthosporium* disease in nursery beds. Spraying with "Perenox" at four pounds in a 100 gallons of water has been found effective.

Among the pests, rice Hispa (*Hispa armigera*) and the stem borer (*Schoenobius incertellus*) are the most serious, and often cause heavy damage all over West Bengal; the latter sometimes destroys the entire crop in the flowering stage. The Hispa is controlled by dusting "Gammexane" or spraying wettable DDT at two pounds in 64 gallons of water. Several measures have been tried against the stem borer, but none has proved successful in destroying the larvae. Tall and succulent varieties have been found more susceptible to it; perhaps the moths of *Schoenobius* find it easy to perch upon the leaves of these varieties and lay eggs there. Short and less succulent varieties escape attack; it remains to be seen whether they become susceptible in the absence of tall and succulent varieties. Other characters responsible for this susceptibility are also under study.

EASY STEPS TO MORE FOOD PRODUCTION

by

Pranlal S. Kapadia

As a result of our long and constant efforts at the Kendra to increase food production, we have come to believe that attention needs to be paid to the following factors.

There is a great shortage of manure in India. So, we would do well to concentrate on the conservation and use of all available local manures. In fact, the Chinese farmer uses more of organic manures than fertilizers, and the food production has increased.

The main requirements of plants are nitrogen, phosphoric acid and potash. The sources of these are abundant in villages: for nitrogen—urine, night-soil, compost, green manure, farmyard manure, flesh manure, leather waste manure, silt, guano, mill-fly waste and fish-waste ; for phosphoric acid—digested bone manure, fish waste ; for potash—ash.

URINE

The value of urine as manure has been scientifically studied at the Indian Agricultural Research Institute, New Delhi. It has been found that the urine execreted in a day by an adult contains 12.10 grams nitrogen, 1.80 grams phosphoric acid and 12.2 grams potash. Urine makes one of the best manures.

Urine should be conserved in pits filled with dry leaves and waste materials. Urine compost becomes ready in three to four months. Conservation of urine can be taken up at places where large amounts of urine are available—schools, educational institutions, jails, hospitals, etc.

SILT

Silt is rich in organic matter, and a very good soil improver. It helps humus formation in the soil. There are a number of tanks in rural areas which are full of very rich silt. The silt from *nalas*, tanks and gutters is collected and used extensively by Chinese and Japanese farmers.

GREEN MANURE

Besides being a good source of nitrogen, a green manure also improves the condition of the soil. One way is to grow green manure crops such as sannhemp and *dhaincha* in the field itself and plough them in. The other method is to grow *Sesbania* or *Gliricidia* on field borders, etc., for obtaining green material for application to the field. *Gliricidia* is considered better since it can be grown on roadsides as a hedge and on field bunds in all climates. The more you lop it, the better its foliage. It can be pruned as many as four times a year, and can be very easily propagated by cuttings or seeds.

COMPOST

Compost is generally prepared in pits; this requires large quantities of material and considerable patience. There is a simple alternative method—the heap method, involving mud plastering. Whatever materials are available can be collected, heaped up and plastered over. The heaps can be prepared along the bunds or in the corners of the field. A special feature of compost preparation in China is inoculating it with small doses of bacterial culture for enriching it.

GAS PLANTS

The major problem of the villagers—that of fuel, is met by utilizing cow-dung cakes, thereby depriving the soil of a very useful and rich manure. We are short of fuel wood, and supply of coal to all villages is not possible. By the installation of gas plants in villages, two ends will be served, viz., fuel and manure. A family gas plant will cost roughly Rs. 500 to 600 and will require about 60 to 80 pounds of cow-dung daily to give the family enough heat for cooking and also one light for four to six hours. The cow-dung used is recovered in a digested form without losing its rich manurial value.

FLESH MANURE

Cooked flesh and leather waste are a good nitrogenous manure having ten per cent nitrogen, and some phosphoric acid and potash. Digested bones are a good source of organic phosphoric acid, containing 27 per cent phosphoric acid, with two per cent nitrogen. India has the largest animal population. An annual estimated death rate, at ten per cent, is 1.8 crores. If all the carcasses were properly utilized, thousands of tons of organic nitrogen and phosphoric manures would be available locally.

BUNDING

Food production in the country can make considerable headway if, along with the full utilization of local manures, certain other simple measures are also adopted. For instance, construction of small *bundharas* on rivulets and *nalas*.

The advantages of *bundharas* are: (1) availability of rich silt, (2) increase in subsoil water, and (3) helping the farmer have a second crop of foodgrains and vegetables, thereby giving him work for at least three more months. In the building of small *nalas*, stones, mud and grass can be used.

Bunding of fields also conserves moisture, checks erosion and enables crops like *tur*, *devkapas* (tree cotton) and other fibre plants to be grown along the bunds.

IMPROVED SEED

Only improved seeds should be used. They yield ten to 15 per cent more. The FAO has fixed 1960 as the target year for covering the whole area under food crops with improved seeds. The FAO has also decided to reduce the number of varieties to a minimum. At present, there are hundreds of varieties of paddy which get mixed up in storage and processing and thus lower the quality of the produce.

Our seed-rate for paddy is about 80 pounds per acre. One reason for this is that the germination percentage is low. Sowing of only healthy seeds will ensure at least 95 per cent germination.

In China and Japan, the sweet potato is grown on a large scale and forms a part of the diet, thereby augmenting the daily food intake. This crop can be easily cultivated in the *kharif* season, and also in other seasons where irrigation facilities exist.

CONTD. FROM PAGE 28

New Drainage Pump

particularly in the deltas, vast areas are affected by deep-water conditions. Even with rice varieties suited to such conditions, normal yields cannot be obtained. It is estimated that in the East Tanjore delta alone over two lakhs of acres suffer from deep, stagnant water. There are similar vast areas in the Kistna and Godavari deltas of Andhra State. It is here that the TAS pump has great potentialities. By pumping out the surplus water in these areas, soil fertility and thereby food production can be increased. The pump is also ideally suited for washing down salts and for subsoil drainage in reclaiming saline areas. By cutting deep drains at intervals and working the mole drain with heavy tractors, these pumps could carry out subsoil drainage very effectively.

The TAS pump has been used for irrigation of high-level land where the gravitational flow is imperfect in the summer months. By virtue of the large delivery of water and the velocity of flow, greater coverage with the available water is possible than with ordinary pumps. The pump is also suited to lifting drain water in salt beds up to four or five feet head.

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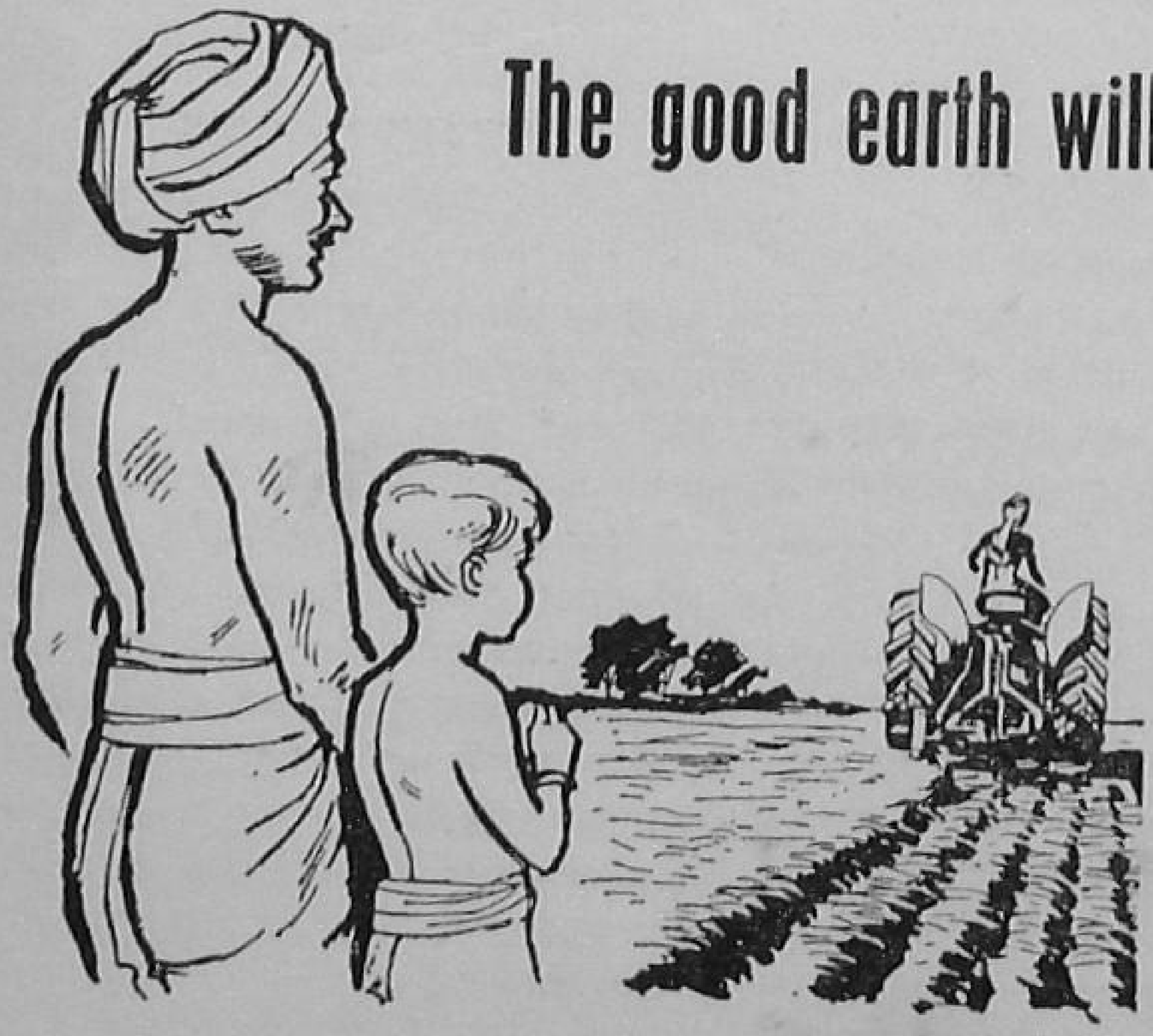
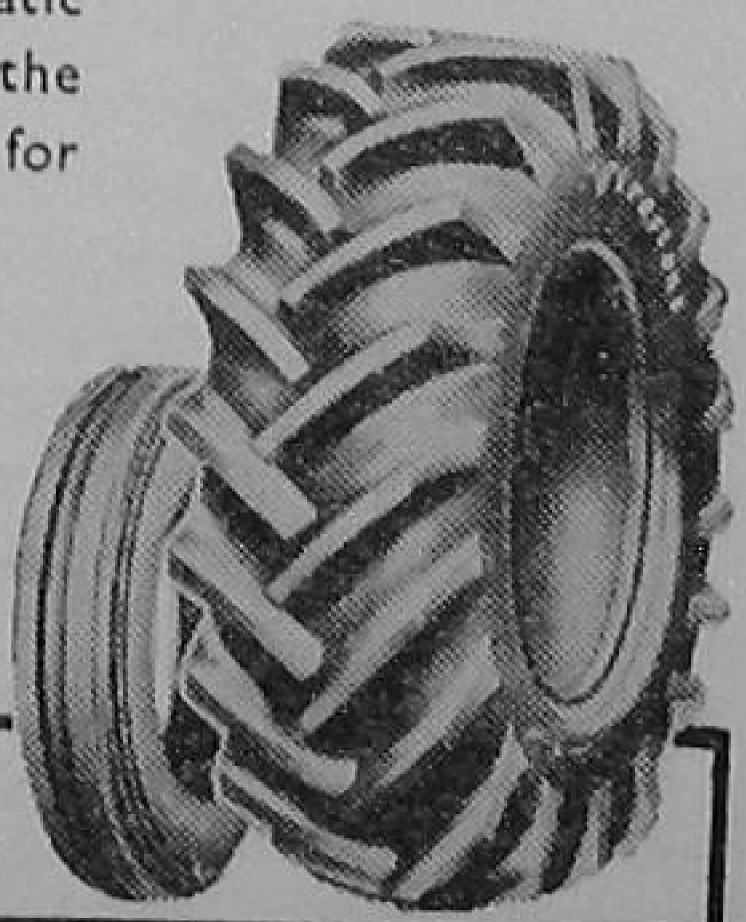


Wisely used, our land can bring prosperity and health to the future generations of those who work it. The tractor, man's untiring helper, is increasingly aiding the farmer in all his tasks. And all these tractors, pulling the implements that till the soil, need tyres—tyres that bite and grip. Firestone must be the farmers' choice—it was Harvey Firestone himself who built the first pneumatic farm tyre thus opening the flood-gates of prosperity for farmers everywhere.



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The Soyabean Deserves to be Grown

by

R.N. Davis

EXPERIMENTS with 28 varieties of soyabeans conducted at Yeotmal, Vidarbha, show that soyabeans can mean gold for India. The proverbially undernourished villager of India can economically enrich his own food as well as that of his livestock by raising soyabeans. Although many farmers who have successfully raised this crop in central India have later discontinued it for lack of a market, yet a potential market exists and is only awaiting development by enterprising farmers and industrialists. For, there are important industries in India which import soyabean oil and its products because they cannot obtain them indigenously.

Soyabeans have been used in China for thousands of years and are used today very extensively in Asia. The soyabean has been called the poor man's meat, and is said to have more uses than any other plant. It is only within the past century, however, that it has become an important crop in the West. It proved to be of great value in wartime as a highly nutritious food ration. In the United States, it now ranks fifth in importance among crops.

Though the soyabean is comparatively little raised in India today, there is every possibility that it will become a major crop here also. There is no known grain that equals the soyabean in nutritional value. It can yield more per acre than many of India's common crops, and thus help the country attain self-sufficiency in food.

FOOD VALUE

It is generally recognized that the diet of the average Indian lacks in proteins, vegetable oils and calories. Soyabeans can be of great value in making up these deficiencies. The following Table will give the comparative nutritional value of soyabeans and of other important grains in India.

Crop	Per cent of Protein	Fat	Carbohydrates	Calcium	Phosphorus	Iron (mg.)	Calorific value per 100 gm.
Rice—raw, milled	6.7	0.7	77.4	0.01	0.16	1.9	343
Jowar (cholam)	10.4	1.9	74.0	0.03	0.28	6.2	355
Bajra (cumbu)	11.6	5.0	67.1	0.05	0.35	8.8	360
Wheat flour, whole	12.1	1.7	72.2	0.04	0.32	7.3	353
Red gram (*dal arhar*) *Tur*	22.3	1.7	57.2	0.14	0.26	8.8	333
Soyabean	43.2	19.5	20.9	0.24	0.69	11.5	432

It will be seen that the soyabean surpasses all in all respects except carbohydrates. To those suffering from diabetes, or for those inclined to be overweight and who yet need a nutritious food, the lack of carbohydrates is an advantage. Soyabeans are rich in vitamins also. One pound of soy flour is equivalent in protein to 2½ pounds of beef, or 54 eggs, or nearly eight quarts of whole milk. In India, one pound of soy flour would cost approximately as much as one-fourth of a pound of meat.

Bread made from whole wheat flour contains 12 per cent protein, but in bread made from one part of soyabean flour and three parts of wheat flour, the protein content is increased to 20 per cent. Likewise, the calcium, phosphorus, iron, vitamin A and vitamin B contents will be increased. The calorific value will be increased from 355 to 374 per 100 grams.

One difficulty is that the people do not like the taste of soyabeans. However, soyabean sprouts have been

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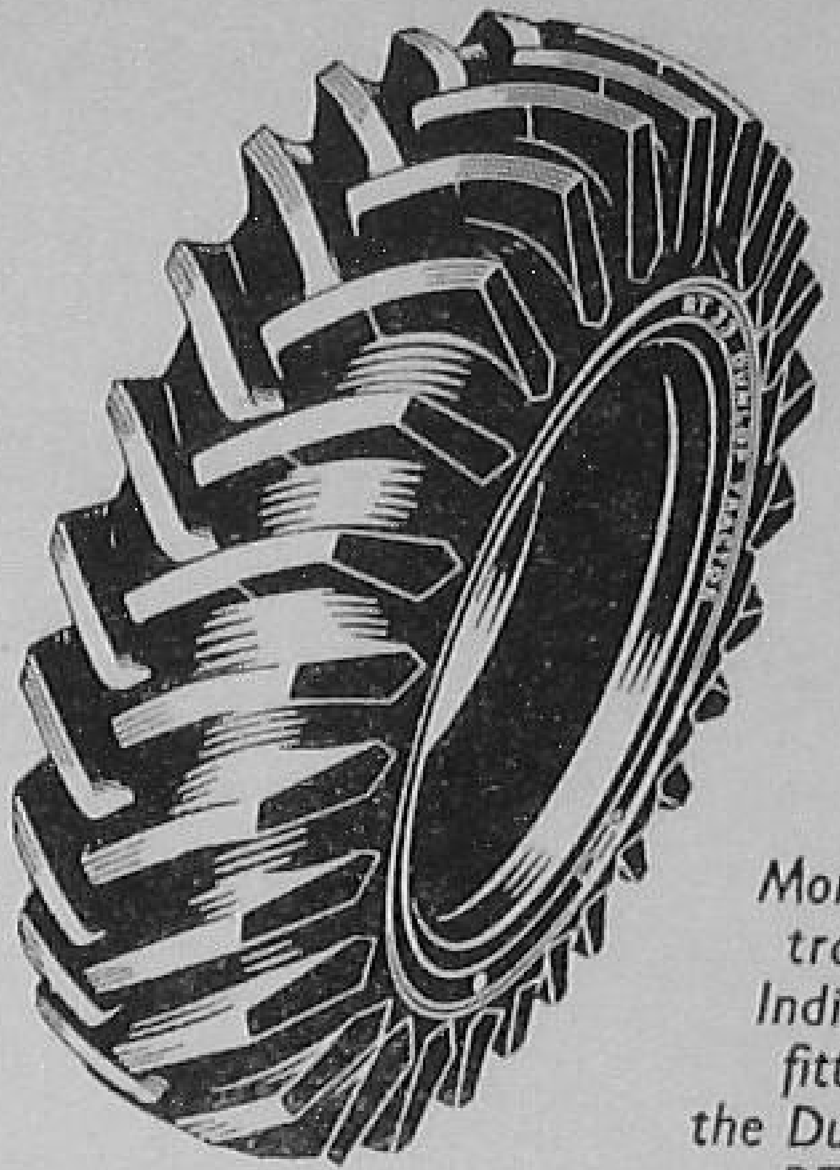

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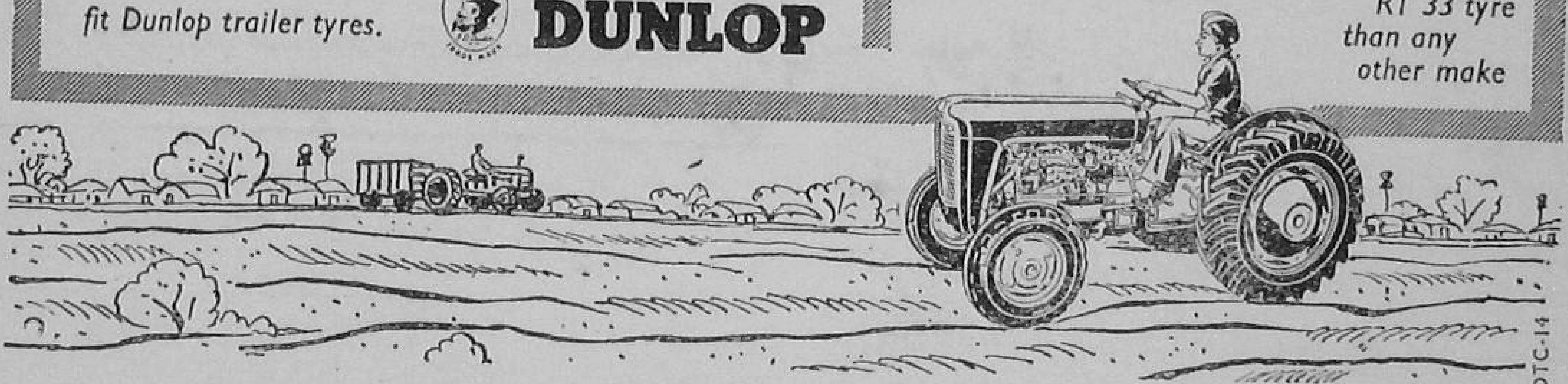

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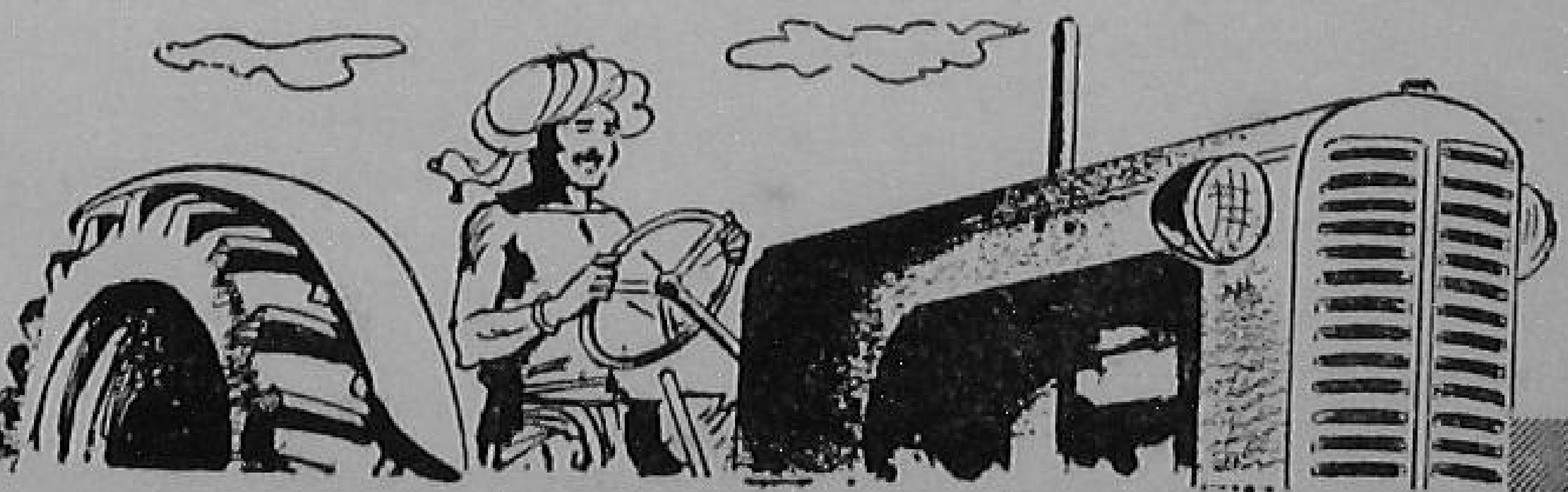

L 46

found to be very acceptable, as also grain soaked in water and fried with curry powder for flavour. When picked green, soyabeans make a very palatable vegetable. They are richer than most vegetables in protein, calcium, phosphorus, iron and energy value. The pods when newly picked are a little hard to shell, but if they are allowed to stand in boiling water for five minutes the beans come out quite easily.

Generally, however, whether as food for men or for animals, it is advisable to mix soy products with other grains, as by themselves they are a rather heavy diet. For *chappaties*, *jowar* bread, wheat bread (*roti*) and other bakery products, two or three parts of the usual flour and one part of soyabean flour give a tasty product. When grinding for flour, the outside shell of the soyabean grain need not be removed.

MANY USES

Soyabean flour from mature beans has been used in various ways in the West as well as in the Orient—in preparing noodles, soups, sweets, ice-cream powders, breakfast foods, and also as an extender in meat products. The Chinese consume large quantities of soyabean milk, curd and sauce.

Soyabeans are grown very extensively in the U.S.A. as feed for animals and poultry. Mixed with other common grains, they make a valuable high-protein feed. In the eastern part of the United States, soyabeans are commonly raised for fodder which is very nourishing and valuable in increasing milk production. Indian cattle and poultry can also benefit from the use of soyabeans in their feed. Some farmers in India have already used soyabeans in this way with good results.

DEPENDABLE CROP

What's more, the soyabean is a more dependable crop than many others. Drought, excessive or out-of-season rains which often cause partial or total crop failures in India, do not do much damage to soyabeans.

Since the soyabean crop matures early and is harvested two or three months earlier than *jowar*, cotton and pulse (*tur*), the farmer is saved the expense of guarding his crop for a long time. Of the 28 varieties planted at Yeotmal, all but one were harvested within three to four months. Another advantage is that if the rows and the seeds in the rows are spaced properly, after two weedings the plants cover the ground so extensively that further growth of weeds is checked.

Soyabean cultivation also enriches the soil by adding nitrogen to it. For soil enrichment, it is advisable, after harvesting the beans, to leave not only the roots and stubble in the ground, but also the straw.

Soyabean oil and its other products are widely used in manufacturing paints, plastics, linoleum, artificial rubber, soap, glue, lubricating greases, fertilizer, disinfectants, oilcloth, printing inks, waterproof fabrics, medicinal oil, waterproofing for cement, textiles, and many other articles, besides being used in preparing cooking fats, margarine, etc. Companies manufacturing paints, linoleum and cooking fats have expressed a definite interest in soyabean oil that might be indigenously produced. It is apparent, then, that a potential market in India now exists for soyabean products.

Soyabeans give excellent yield when the seed is well-inoculated and properly spaced. In Vidarbha, the average farmer raises from seven to 20 maunds per acre of other grains, whereas soyabeans have given 20 to 30 maunds.

YEOTMAL TRIALS

Trials were carried out at Yeotmal, from 1953 to 1958, under the direction of Dr. Cartter of the University of Illinois, who is also Director of the Southern Regional Soyabean Laboratory of the U.S. Department of Agriculture. Dr. Cartter sent out 23 varieties of soyabeans which he had selected as probably most suited to this part of India. He also sent inoculation for the same. Five other varieties were obtained in India. Of these 28 varieties, four have been found to be very good producers, while six others produced moderately well. The remaining 18 proved very poor and were discontinued after a few years.

The soil being deep black at Yeotmal, the rows were spaced 24 and 30 inches apart. In such rows, seeds spaced about one inch apart gave the maximum yield, and this system was adopted during the last three years of the trial. In the earlier years, the seed had been planted three to four inches apart and the yield was found to be low.

Planting was done in late June or early July, as soon as the soil was well damped by two or three showers. The crop performs much better if the soil or seeds are inoculated before planting. The soil may be inoculated by scattering over it soil in which soyabeans had developed well-nodulated roots. In a new area, it is advisable to plant soyabeans in the same place for two or three years before rotating crops ; the soil thus gets well-inoculated.

Where the usual method of planting is used, the rows being about 15 inches apart, the maximum yield should be obtained by spacing the seeds about two inches apart.

A summary of the Yeotmal trials is given in the following Table. The row spacing was 30 inches.

Variety	*Number of years raised*	*Seed spacing in rows in inches*	*Percentage of germination (2 years)*	*Average yield per acre in maunds*
Mamotan	6	1	62	24.19
Acadian	6	1	74	19.31
Improved Pelican	6	1	50	16.82
Biloxi	6	1	47	16.50
No. 55	2	3	..	12.54
Tanner	6	1	55	12.37
Palmetto	6	1	53	12.20
Cherokee	6	1	47	11.83
C.N.S.	5	1	57 (one year)	11.71
Seminole	5	1	31 (one year)	9.36
Jackson	2	1	39	8.74
Lee	2	1	49	8.69
Yelnando	6	1	42	7.21
Wood's Yellow	5	1	19	4.41

NINE GROUPS

In the U.S.A., soyabeans are classified into nine groups. In groups 0 and 1 are those raised in the northern part near the Canadian border. Group II is raised in the zone adjacent to the south; group VIII belongs to the extreme south. The varieties sent by Dr. Cartter were mostly of Groups VII and VIII. Soyabeans are very sensitive to the length of day. The kinds that do well in the southern zones do not thrive in the north, and *vice versa*. The varieties used at Yeotmal did not mature when planted in the cold season.

In India also, it will no doubt be found that there are natural zones for soyabeans from the north to the south, so that varieties that do well in the north are not suitable for the central and southern areas, and so on.

SOYABEAN Vs. GROUNDNUT

Since groundnuts are widely raised in parts of central India both for food and for their soil, the question naturally arises whether soyabeans would find a market in competition with them. In this connection, the following considerations should be noted:

(1) Soyabeans have a much greater variety of uses than groundnuts. Although the latter will produce more oil than the same amount of soyabeans, soyabean oil has many more commercial uses than groundnut oil.

(2) Soyabeans contain more protein than groundnuts.

(3) Soyabeans are better adapted to varying conditions of soil and climate than groundnuts.

(4) Soyabeans enrich the soil, whereas groundnuts take much food out of it.

(5) Soyabeans are easier and less expensive to grow than groundnuts. The cost of cultivation of soyabeans in central India is about Rs. 31.50 per acre, compared to about Rs. 85 for producing the same amount of groundnuts.

(6) Soyabeans suffer little from irregular rains, whereas groundnuts at times experience partial or nearly total crop failure from such causes.

(7) In areas of the U.S.A. where both groundnuts and soyabeans are grown, the former gives a higher profit per acre than soyabeans, but the average for groundnuts is limited by government to reduce surpluses, whereas the market for soyabeans is ever-increasing.

Soyabeans should, therefore, readily find a place in India's economy even in competition with groundnuts. If the farmer plants soyabeans along with his other crops, it will give him more nutritious food, besides the prospects of a well-paying market. Soyabeans can help meet the needs of India's growing industries.

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Sesbania Goes Round Madras Field Borders

by
A. Muhammad Ali
Joint Director of Agriculture, Madras

SESBANIA SPECIOSA has sure caught on with the farmers in Madras State. Starting with a handful of seeds in 1952, the Madras Agricultural Department by 1956 had succeeded in getting *Sesbania* planted on the borders of over a million acres of paddy fields. About 6,000 bags of seed are now obtained, apart from what the farmers retain for their own use.

The usual green manures grown in the State are wild indigo (*Tephrosia purpurea*), indigo (*Indigofera sumatrana*), sannhemp (*Crotolaria juncea*), *pillipesara* (*Phaseolus trilobus*), *dhaincha* (*Sesbania aculeata*) and *Sesbania speciosa*. But indigo and wild indigo commence rotting if heavy showers are received during the growing period and water stagnates; *dhaincha* becomes woody if allowed to stand for more than three months; *pillipesara* cannot withstand drought or stagnation.

Not so with *Sesbania speciosa*. During drought, it gets stunted in growth, but recovers rapidly on return of favourable conditions; unlike other green manure plants, it withstands water-logging, too. It is ready for incorporation as green manure in about two months, giving about 10,000 pounds of green matter per acre. With a high seed-rate of 60 to 90 pounds per acre, the plants grow thin and remain soft even after five months of sowing. That is why it remains unrivalled.

Way back in 1952, the Research Stations at Pattukottai and Aduthurai planted *Sesbania* seedlings along the borders of *kuruvai* paddy fields at the time of planting, i.e., in July. The spacing was four inches between plants. The seedlings were obtained from seeds sown in a nursery alongside paddy nurseries.

Four ounces of seed was enough for border-planting an acre; that gave 1,500 to 2,000 pounds of green leaves at the harvest of the short-term *kuruvai* paddy.

Enough *Sesbania* plants, one foot apart, were left standing for seed purposes. The remaining plants (about two-thirds) were pulled out and trampled in as green manure for the second paddy crop. The standing plants yielded seed in January; this seed was used in February for raising a pure crop of *Sesbania* in single-crop lands for use in July as green manure. The seed-rate was 60 pounds, which gave about 50,000 pounds of green leaves—sufficient for ten acres.

Batches of farmers were taken to the Research Stations, and also to places where *Sesbania* had been planted on a large scale, to see the crop. Cinema slides were prepared by Village Agricultural Associations—of which there are 16,000 in the State—and shown free at rural theatres. District Agricultural Officers addressed meetings of these Associations; four-ounce packets of *Sesbania* seed were distributed at a price of one anna each.

In 1953, the supply of seed was inadequate. The most enthusiastic farmers or village leaders, therefore, raised *Sesbania* nurseries in one-third or one-acre plots, and distributed the seedlings free of cost to smaller farmers.

Various methods were adopted by the Department to popularize *Sesbania*. The Village Associations were informed that every pound of *Sesbania* produced by them would be purchased at four annas a pound, or Rs. 40 per bag of 160 pounds. It was also impressed upon them that this way the *Sesbania* would pay for the entire *kist* of land tax, and they would not have to sell their paddy at low prices just after harvest to pay the *kist*.

The co-operation of the *panchayats* was also enlisted. In Tanjore district, paddy seedlings were raised before the project water was received. The presidents of *panchayats* were prevailed upon to raise *Sesbania* seedlings along with paddy nurseries; the needs of many small cultivators were met in this way. A large number of big farmers joined the campaign as "*Sesbania* donors."

In fact, border-planting of *Sesbania* has spread faster than any other improved method in the agricultural history of Madras State.

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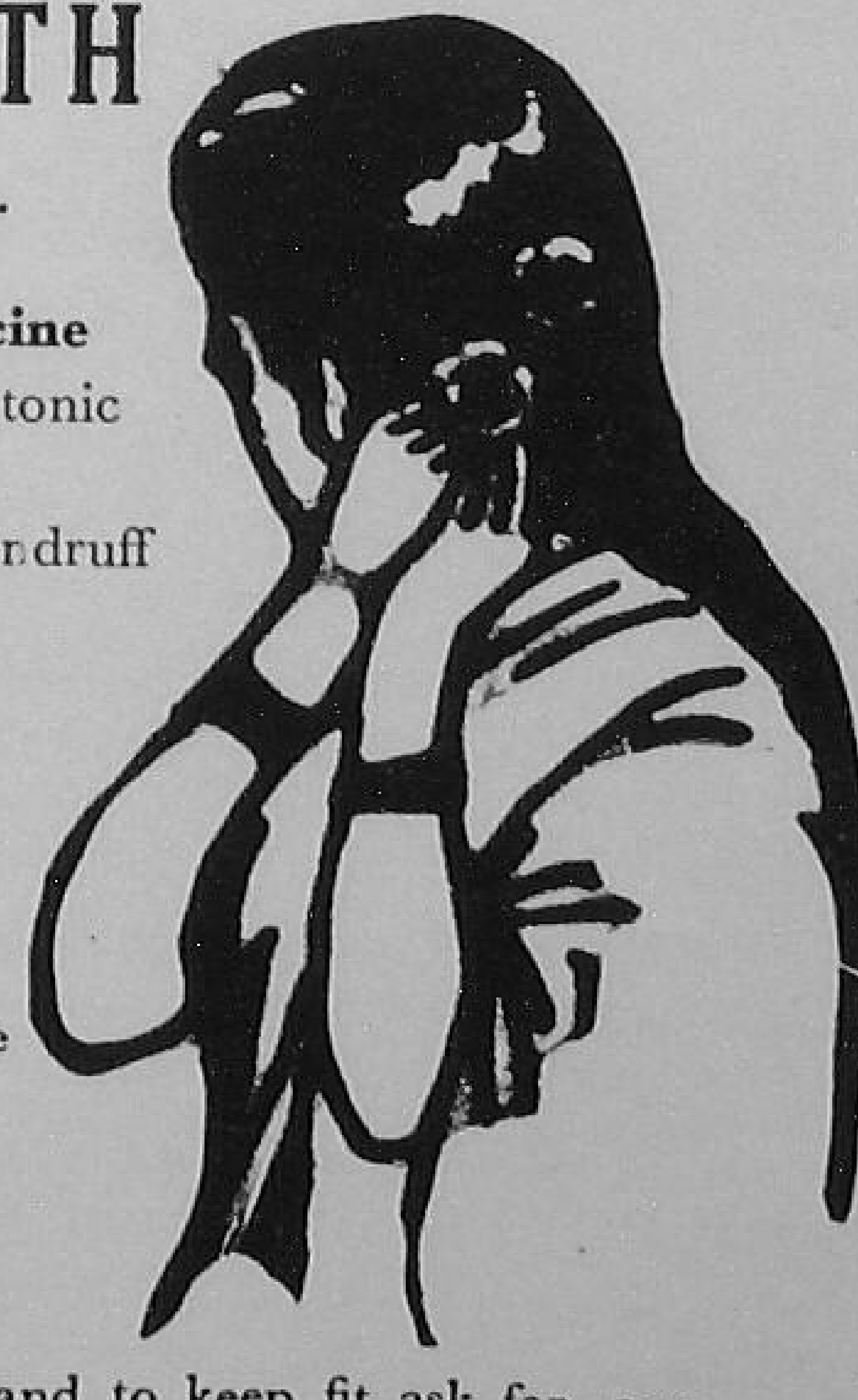

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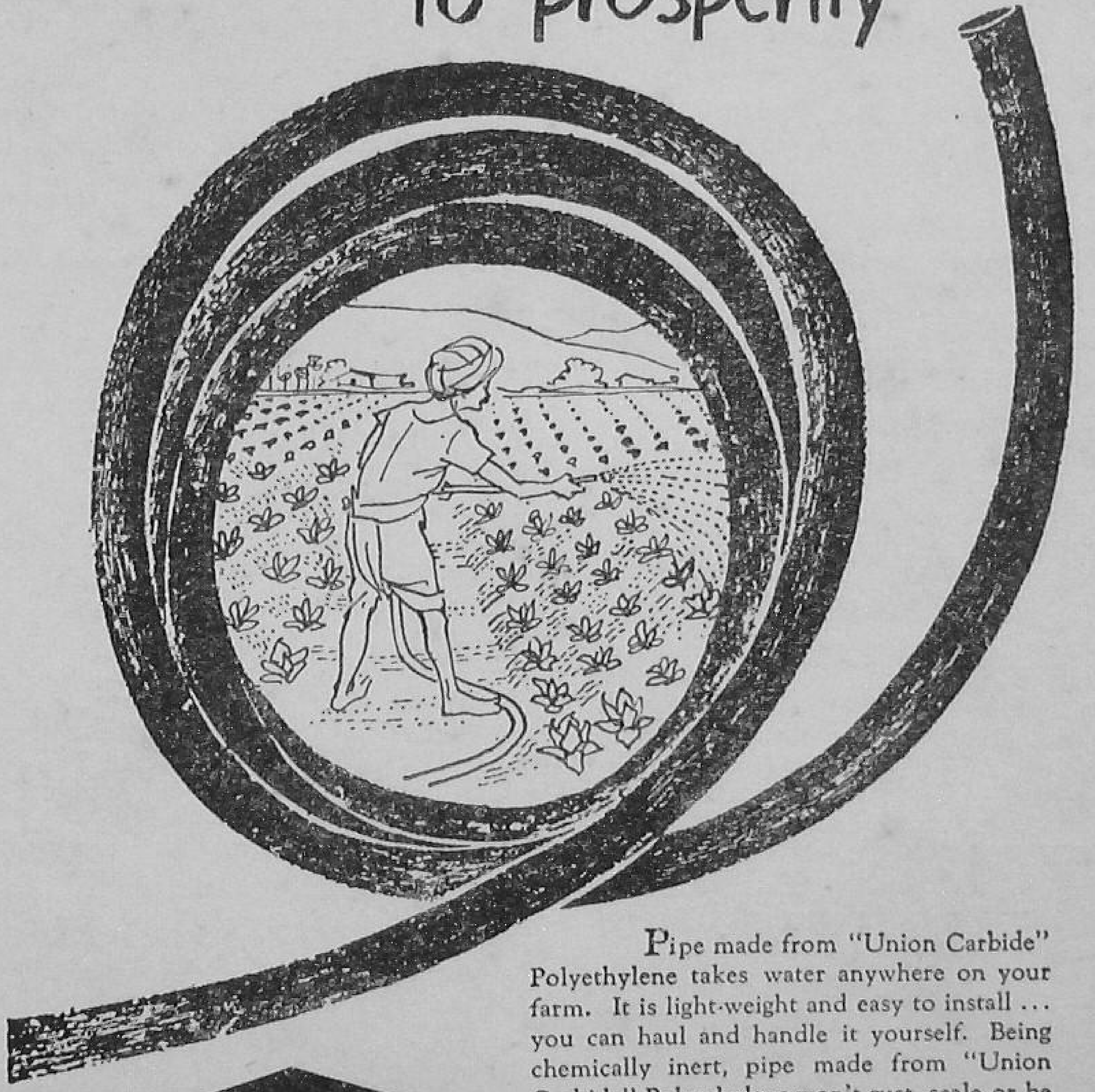

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